CONSTRUCTION DOCUMENTS
PROJECT MANUAL

FOR

Redskin Training Center & Locker Room Renovation:

600 East Park Street, Fort Loramie, Ohio 45845

Elementary School Addition:

35 Elm Street, Fort Loramie, Ohio 45845

OWNER

Fort Loramie Local School Board of Education

575 Greenback Road
Fort Loramie, Ohio 45845

Book 1 of 2

GARMANN MILLER

Minster, OH | Columbus, OH | Indianapolis, IN | Fort Wayne, IN

December 11, 2025

Project Number: 25041.00

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SECTION 00 11 13 - ADVERTISEMENT FOR BIDS

Sealed proposals will be received by Fort Loramie Local School District Board of Education at, Fort Loramie High School Office, Door 1, Media Room 310, located at 600 East Park Street, Fort Loramie, Ohio 45845, until January 15, 2025 at 01:00.00 PM, at which time and place proposals will be opened publicly and read aloud. Proposals received after January 15, 2025 at 01:00.00 PM will be returned unopened. Proposals shall be for the furnishing of materials and the performance of labor necessary for the:

25041.00 Fort Loramie Local Schools Athletic Complex Building & Associated Improvements

Redskin Training Center & Locker Room Renovation:
600 East Park Street, Fort Loramie, Ohio 45845

Elementary School Addition:
35 Elm Street, Fort Loramie, Ohio 45845

All in accordance with the Contract Documents prepared by Garmann/Miller & Associates, Inc., Minster, OH | Columbus, OH | Indianapolis, IN | Ft. Wayne, IN

A Lump Sum bid for the project will be received.

A prebid meeting will be held at 1:00 PM on Thursday, December 18, 2025 at Fort Loramie High School Office, Door 1, Media Room 310, located at 600 East Park Street, Fort Loramie, Ohio, 45845 . The pre-bid meeting is not mandatory but bidders are strongly encouraged to attend. The facility will be open for inspection at this time.

A Bid Security in the form of a certified check, cashier's check, irrevocable letter of credit, or surety company bond pursuant to Chapter 1305 of the Ohio Revised code in the amount of 10% of the total bid shall accompany each bid; or a bid guaranty bond in accordance with Chapter 153.571 of the Ohio Revised Code in the amount of 100% of the total bid shall accompany each bid.

The Contract Documents, including Drawings and Specifications, are on file for public inspection at the office of the Architect: Garmann/Miller & Associates Inc., Phone 419-628-4240: the office of the Fort Loramie Local School District Board of Education; Construction News Corporation, the McGraw Hill-Dodge Plan Room, the Builders Exchange and iSqFt.

Contract Documents may be purchased from DC Reprographics, 1254 Courtland Ave, Columbus, Ohio 43201; www.DCplanroom.com; Phone 614-297-1200. Each Bidder is responsible for shipping cost or providing a shipping number for billing to the bidders account.

Each bid must be submitted in duplicate on a blank form furnished by the Architect, in a sealed envelope. Mark plainly on the outside of the envelope, the project you are bidding on. No bidder may withdraw their bid for a period of sixty (60) days after the bid opening

The Owner reserves the right to reject any or all bids and to waive informalities, irregularities and/or errors in the bids to the extent permitted by law. This includes the right to extend the date and time for receipt of bids.

This notice is posted on the Fort Loramie Local School District web site.

Notice can be accessed at: www.loramie.k12.oh.us

The Date of this notice: December 11, 2025

By: Fort Loramie Local School District Board of Education

SECTION 00 11 30 - ABBREVIATED SCOPE OF WORK

THE FOLLOWING IS AN ABBREVIATED SCOPE OF WORK INTENDED TO PROVIDE POTENTIAL BIDDERS WITH INFORMATION AS TO THE SIZE AND NATURE OF THE PROJECT. BIDDERS ARE TO REFER TO THE DRAWINGS AND SPECIFICATIONS FOR THE COMPLETE SCOPE OF WORK.

Project: **25041.00 Fort Loramie Local Schools Athletic Complex Building & Associated Improvements**

600 East Park Street

Fort Loramie, Ohio 45845

GM Project Number: **25041.00**

Bid Date: **January 15, 2025 at 01:00.00 PM**

Bid Categories: **Lump Sum General Contract**

Estimate of Construction Cost: **$9,000,000.00**

PROJECT SCOPES OF WORK

General Construction:

Three proposed building projects within the contract documents. Athletic complex is a new construction building with Masonry, structural steel, and pre-engineered metal building types. Building includes, conventional framed low slope roof weight room, pre-engineered metal building turf room and multipurpose sports court and a masonry bearing mezzanine with athletic equipment. Locker room building is a renovation of the existing weight room into a varsity football locker room. Scope consists of demolition, interior renovations, HVAC improvements and exterior storefront. Elementary building addition scope includes demolition, concrete, masonry, structural steel and wood gymnasium flooring.

Site Work:

Scope includes but is not limited to; site clearing/demolition, new concrete pavement, curbs, asphalt, mill and fill of existing asphalt, louvre screen fence, gravel pavement, grading/earthwork, seeding and planting.

Fire Protection Work:

Scope includes but is not limited to; new riser and sprinkler system as shown on plans.

Plumbing Work:

Scope includes but is not limited to; new plumbing fixtures with water, sanitary, and vent system, gas piping for mechanical equipment, and roof drains with storm piping as shown on drawings.

HVAC Work:

Athletic complex consists of new work, including but not limited to, new mechanical equipment (RTUs, exhaust systems, terminal equipment), and building automation system (BAS). Existing locker room building renovation includes new exhaust and makeup air systems as shown on plans.

Electrical Work:

Demolition of lighting and power in existing building areas. New work consists of, but not limited to fire alarm, power to receptacles (surface raceway where required in existing buildings), and mechanical equipment. New LED lighting throughout the renovation space and the new athletic building controlled by occupancy sensors and low voltage switches. Sound systems in the existing locker room and the athletic building.

Technology Work:

Scope includes but not limited to; Installation of CAT6A, Fiber, and speaker cabling. Installation of security cameras, access control, security system, clocks, and access points. Installation of network rack equipment and network racks. Add new devices to existing camera, access control, and security systems.

END OF SECTION 00 11 30

AIA® Document A701® – 2018

Instructions to Bidders

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

Fort Loramie Local Schools Athletic Complex Building & Associated Improvements
600 East Park Street
Fort Loramie, OH 45845

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

Fort Loramie Local School District Board of Education
575 Greenback Road
P.O. Box 26
Fort Loramie, OH 45845

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

Garmann/Miller & Associates, Inc.
38 S. Lincoln Drive,
P.O. Box 71
Minster, OH 45865

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

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

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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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.)

§ 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.

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§ 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.)

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

§ 3.3 Substitutions

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

§ 3.3.2 Substitution Process

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

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

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

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

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

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

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

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§ 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.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

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

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

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

§ 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.)

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,

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unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

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

§ 6.3 Submittals

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

- **.1** a designation of the Work to be performed with the Bidder's own forces;
- **.2** names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- **.3** names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

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

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

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

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

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

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

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

§ 7.2 Time of Delivery and Form of Bonds

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

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

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

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

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

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

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

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

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 Building Information Modeling Exhibit, if completed:

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

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

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

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

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.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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SECTION 00 22 13 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

MODIFICATIONS TO AIA A701

Article 2 Bidder's Representations

Add the following to Article 2

2.2 A prebid meeting will be held at 1:00 PM on Thursday, December 18, 2025 at Fort Loramie High School Office, Door 1, Media Room 310, located at 600 East Park Street, Fort Loramie, Ohio, 45845 . The pre-bid meeting is not mandatory but bidders are strongly encouraged to attend. The facility will be open for inspection at this time.

Article 3 Bidding Documents

3.1 Distribution

Change Paragraphh 3.1.3 as follows

Bidding documents will be issued directly to sub-bidders as offered in the Notice to Bidders.

3.2 Modification or Interpretation of Bidding Documents

Add Paragraph 3.2.1.1 as follows

3.2.1.1 Each Bidder is responsible for calling to the attention of the Architect any ambiguities, inconsistencies, errors, or omissions which may occur in the documents for their part of the Work. If Bidder fails to request clarification, the bidder will be expected to overcome such conditions without additions to the bid amount.

Add Paragraph 3.2.2.1 as follows

3.2.2.1 Clarification or interpretation can be made via fax, 419-628-4299 or telephone, 419-628-4240 or email to Jacob Roberts; jroberts@creategm.com

3.4 Addenda

Delete paragraph 3.4.3 and substitute the following

3.4.3 If an addendum is issued within 72 hours prior to the published time for the opening of bids (excluding Saturdays, Sundays, and legal holidays), the the time for opening of bids shall be extended one (1) week with no further advertising required.

Article 4 Bidding Procedures

4.1 Preparation of Bids

Add Paragraph 4.1.1.1

Any substantial change, alteration or wording of the bid form may cause a bid to be rejected as not responsive.

Change Paragraph 4.1.3 as follows

4.1.3 Sum shall be expressed in both words and numbers and in numbers only where no space is provided for words. In case of discrepancy, the amount written in words shall govern.

Add paragraph 4.1.5.1 and 4.1.5.2 as follows

4.1.5.1 A blank entry or an entry of "No Bid", "N/A" or similar entry on any alternate will cause a bid to be rejected as non responsive if that alternate is selected.

4.1.5.2 If an alternate is not selected and an entry of "No Bid", "N/A" or similar entry for the alternative is listed, this action, by itself, will not render the bid as non responsive.

Add Paragraph 4.1.8 as follows

4.1.8 The bidder shall include a signed copy of the Non-Collusion Affidavit and Contractor's Affidavit with their bid, a copy is included in the Project Manual.

4.2 Bid Security

Delete paragraphs 4.2.1, 4.2.2, 4.2.3, and 4.2.4 and substitute the following:

4.2.1 Each bid will be accompanied by a bid security in accordance with Section 153.54 (B), Ohio Revised Code, in the amount of the base bid plus add alternates or:

4.2.2 A signed bond in the form of a certified check, cashier's check or letter of credit, as provided in Section 153.54 (C), ORC. The amount of the certified check, cashier's check or letter of credit shall be equal to ten (10) percent of the base bid plus add alternates or:

4.2.3 Bid guaranty and contract bond in accordance with Chapter 153.571 of the ORC in the amount of 100 percent of the total base bid plus add alternates. If the dollar space on the bid guaranty is left blank, the penal sum will be the full amount of the base bid plus add alternates, stated in dollars and cents. A percentage is not acceptable, pursuant to Section 153.571, ORC.

4.2.4 The bond shall serve as an assurance that the bidder will, upon acceptance of the bid, comply with all conditions precedent for contract execution, within the time specified.

4.2.5 The bond must be issued by a surety authorized by the Department of Insurance to transact business in Ohio. The bond must be issued by a surety capable of demonstrating a record of competent underwriting, efficient management, adequate reserves, and sound investments. These criteria will be met if the surety currently has an A.M. Best Company Policy Holders Rating of "A+", "A" or "A-" or better and has or exceeds the Best Financial Size Category of Class VII. The bond must be signed by an authorized agent, with Power of Attorney, from a surety.

4.2.6 Bond will be returned to all unsuccessful bidders after contract is awarded. If used, a certified check, cashier's check or letter of credit will be returned to the successful bidder upon providing the bond required by Section 153.54 (C), ORC.

4.2.7 If for any reason, other than as authorized by Article 4.4, Modifications or Withdrawal of Bid, the bidder fails to enter into a contract, and the owner awards the contract to the next lowest responsive and responsible bidder, the bidder who failed to enter into a contract shall be liable to the owner for the difference between the bidder's bid and the bid of the next lowest responsive and responsible bidder, or for a penal sum not to exceed (10) percent of the bid amount, whichever is less, pursuant to Section 153.54 ORC.

4.3 Submission of Bids

Add Paragraph 4.3.1.1 as follows

4.3.1.1 Bids shall be submitted on Bid Form included in Project Manual. Submit paper copies of bid(s) in duplicate.

Add Paragraph 4.3.6 as follows

4.3.6 All bids are valid for (60) days after the opening of bids. A bid may be extended thereafter upon mutual agreement, in writing, between the owner and contractor. Awards beyond the sixty (60) day period shall be reviewed for increased cost of the contract only if the cause for delay is no fault of the contractor and substantiated.

4.4 Modification or Withdrawal of Bid

Delete paragraph 4.4.3 and substitute the following:

4.4.3 A bidder may withdraw a bid from consideration after the bid opening if the bid amount was substantially lower than the amounts of other bids, providing the bid was submitted in good faith, and the reason for the bid amount being substantially lower was a clerical mistake as opposed to a judgement mistake, and was actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of work, labor or material made directly in the compilation of the bid amount. Request to withdrawal bid must be made in writing filed with the owner and architect within two business days after conclusion of the bid opening.

Article 5 Consideration of Bids

5.2 Rejection of Bids

Add paragraphs 5.2.1, 5.2.2 and 5.2.3 as follows

5.2.1 If the lowest Bidder is not responsive or responsible, the Owner shall reject such bid and shall notify the Bidder the reasons for the finding.

5.2.2 A Bidder notified that he is not responsive or responsible may object to the Owner's decision by filing a written request for reconsideration, which must be received by the Owner within five (5) days of the date of the notice from the Owner.

5.2.3 Upon receipt of a timely request, the Owner shall meet with the Bidder to listen to the Bidder's objections.

a) No award of contract shall become final until the Owner has met with all Bidders who have filed timely request for reconsideration.

b) If all request for reconsideration are rejected in the Owner's discretion, the award of contract shall become final, or the Owner, in its discretion, may reject all bids.

c) If a request for reconsideration is not rejected, any procedures for the determination of the lowest responsible Bidder that have not already been completed concerning the applicable Bidder shall be completed. Following the completed procedures and evaluation of the Bidder, the Bidder will be notified of the findings.

5.3 Acceptance of Bid (Award)

Add paragraphs 5.3.1.1, 5.3.1.2 and 5.3.1.3

5.3.1.1 Pursuant to Section 153.08, ORC, the contract will be awarded to the lowest responsive and responsible bidder.

5.3.1.2 In determining the lowest Bidder, the owner shall consider the base bid and any selected alternates which the owner determines to accept. The Owner shall have the right to select alternates in any combinations. The lowest bidder will be based on the lowest base bid plus selected alternates, and may result in an award to a Bidder other than the Bidder that submitted the lowest base bid. Voluntary alternates will not be considered in determining the lowest amount.

5.3.1.3 The Bidder acknowledges that although there is an estimate for the cost of the Project, the market conditions may and frequently do result in the estimate being different from the sum of the bids received, either higher or lower. The Bidder understands that the Owner has included alternates, which include deduct and add alternates, to give flexibility in building the Project with funds available. The Bidder further understands and acknowledges that the use of add and deduct alternates is a long held customary practice in the construction industry in the State of Ohio. The Bidder also acknowledges that the Owner will not make a decision about what alternates on which to base the award of contracts until the bids are received, and the Owner can compare its available funds with the base bids and the cost or savings from selecting different alternates.

Delete paragraph 5.3.2 and substitute the following

5.3.2 Subject to the right of the owner to reject each and every bid, the owner will determine the lowest responsive bid by taking into consideration not only the amount of the bid but such of the following criteria as it, in its discretion, deems appropriate and may give such weight thereto as it deems appropriate in determining the responsibility of the bidder:

The bidder's financial ability to complete the contract.

The bidder's experience with projects of similar size and scope and more complex projects.

The conduct and performance of the bidder on previous contracts completed in a timely manner.
The bidders facilities and equipment.
The adequacy, in numbers and experience, of the bidders work force to complete the contract successfully on time and on budget.
The ability of the bidder to execute the contract properly.
The evaluation of the bid substantially below the median of other bids.

Add paragraphs 5.3.3, 5.3.4 and 5.3.5

5.3.3 The Owner shall obtain from the lowest Bidder any information the owner deems appropriate to the consideration of factors showing responsibility. The failure to submit requested information on a timely basis may result in the determination that the bidder is not responsible.

5.3.4 The Bidder authorizes the Owner and its representatives to contact owners, construction managers, contractors, and design professionals on projects on which the Bidder has worked and authorizes and requests such owners, construction managers, contractors, and design professionals to provide a candid evaluation of Bidder's performance. By submitting a bid, the Bidder agrees that if he or any person at his urging, directly or indirectly, brings action against any of such owners, construction managers, contractors, and design professionals or their employees as a result of or related to such candid evaluation and such action is not successful, the Bidder will reimburse such owners, design professionals and/or their employees for all legal fees and expenses incurred by them that are related to such legal action, including the cost of collection. This obligation is expressly intended for the benefit of such owners, construction managers, contractors, design professionals and their employees.

5.3.5 The number of consecutive calendar days required to complete the work shall be considered by the owner in determining the lowest and responsive bidder.

Article 7 Performance Bond and Payment Bond

7.1 Bond Requirements

Delete paragraphs 7.1.1, 7.1.2, 7.1.3, 7.1.4 and substitute the following:

7.1.1 The bidder shall furnish bonds covering the faithful performance of the contract and payment of all obligations arising thereunder.

7.1.2 Prior to award of contract, successful bidders who provided a cashier's check, certified check or letter of credit as bid security shall submit a contract bond in the form of a performance and payment bond in an amount equal to 100% of the contract sum. The performance and payment bond must be signed by an authorized agent of an acceptable surety bonding company and by the bidder. Bond must be issued by a surety company authorized by Ohio Department of Insurance to transact business in the State of Ohio. The bond shall be issued by a surety company which can adequately demonstrate a record of competent underwriting, efficient management, adequate reserves and soundness of investments. These criteria will be met if the surety currently has an A.M. Best Company Policyholder Rating of "A+", "A", or "A-" or better and has or exceeds the Best Financial Size Category of Class VII.

7.1.4 Bond must be countersigned by an Ohio resident agent if bond is issued by an out-of-state agent.

7.1.5 Performance and payment bond must be supported by credentials showing power of attorney and corporate seals to each copy.

Bonds shall remain in effect for 12 months after date of substantial completion is issued by the owner. Certificate by bonding company of compliance is required prior to final acceptance of project.

END OF SECTION 00 22 13

SECTION 00 31 19
EXISTING CONDITION INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:

B. Site and Utility Survey: Entitled, SS1.1

C. Geotechnical Report: Entitled, Geotechnical Subsurface Investigation Proposed New Athletic Building, dated October 16,2025.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 00 31 19

SECTION 00 41 13 - BID FORM

THE PROJECT AND THE PARTIES

TO:

Fort Loramie Local School District Board of Education
575 Greenback Road, PO Box 26
Fort Loramie, Ohio45845

FOR:

Project: 25041.00 Fort Loramie Local Schools Athletic Complex Building & Associated Improvements

Project Number: 25041.00

Redskin Training Center & Locker Room Renovation:
600 East Park Street, Fort Loramie, Ohio 45845

Elementary School Addition:
35 Elm Street, Fort Loramie, Ohio 45845

DATE: _____ (Bidder to enter date)

SUBMITTED BY:

Bidder's Full Name: _____

Address: _____

City, State, Zip: _____

Telephone:_____

Fax No.: _____

E-mail: _____

OFFER

Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Garmann/Miller & Associates Inc. for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

Item 1 - Contract A, General Construction - Base Bid:

_____

_____ dollars

All Cash and Contingency Allowances described in Section 01 21 00 are included in the Bid Sum.

Item 1a - Alternate 01 - Elementary School Building Scope:
If Alternate 01 is accepted, add:

_____

_____ dollars

Item 1b - Alternate 02 - Masonry Veneer for Athletic Complex:
If Alternate 02 is accepted, add:

_____

_____ dollars

Item 1c - Alternate 03 - Synthetic Turf:
If Alternate 03 is accepted, add:

_____

_____ dollars

Item 1d - Alternate 04 - Graphics and Signage:
If Alternate 04 is accepted, add:

_____

_____ dollars

Item 1e - Alternate 05 - Acoustical Treatment:
If Alternate 05 is accepted, add:

_____

_____ dollars

Item 1f - Alternate 06 - Epoxy Flooring:
If Alternate 06 is accepted, add:

_____

_____ dollars

Item 1g - Alternate 07 - Site Furnishings:
If Alternate 07 is accepted, add:

_____

_____ dollars

Item 1h - Alternate 08 - Controls:
If Alternate 08 is accepted, add:

_____

_____ dollars

Item 1i - Alternate 09 - Metal Panel (Deduct Alternate):
If Alternate 09 is accepted, deduct:

_____

_____ dollars

Item 1j - Alternate 10 - Roof Panel (Deduct Alternate):
If Alternate 10 is accepted, deduct:

_____

_____ dollars

Item 1k - Alternate 11 - Additional Acoustical Double-Wall Ductwork:
If Alternate 11 is accepted, add:

_____

_____ dollars

We have included the Bid Bond or security deposit as required by the Advertisement, Notice to Bidders, Instructions to Bidders.

This is a Tax Exempt Project.

Builders Risk Insurance is to be furnished by the Owner.

ACCEPTANCE

This offer shall be open to acceptance and is irrevocable for sixty days from the bid closing date.

If this bid is accepted by Owner within the time period stated above, we will:
Execute the Agreement within ten (10) days of receipt of Notice of Award.
Commence work within ten (10) days after written Notice to Proceed of this bid.

If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Owner by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

CONTRACT TIME

Owners desired start date:
Redskin Training Center: March 01, 2026
Locker Room Renovation: May 01, 2027
Elementary School Addition: June 01, 2026

Owners desired completion date:
Redskin Training Center: April 30, 2027
Locker Room Renovation: July 01, 2027
Elementary School Addition: August 15, 2026

If this Bid is accepted, we will:

Redskin Training Center: Complete the Work by April 30, 2027 or at an earlier date of _____ (Bidder to enter completion date or time frame prior to completion date listed.)

Locker Room Renovation: Complete the Work by July 01, 2027 or at an earlier date of _____ (Bidder to enter completion date or time frame prior to completion date listed.)

Elementary School Addition: Complete the Work by August 15, 2026 or at an earlier date of _____ (Bidder to enter completion date or time frame prior to completion date listed.)

ADDENDA

The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.

Addendum # _____ Dated _____.
Addendum # _____ Dated _____.
Addendum # _____ Dated _____.
Addendum # _____ Dated _____.

BID FORM SUPPLEMENTS

Bid Bond

Noncollusion Affidavit

Contractor's Affidavit

BID FORM SIGNATURE(S)

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer)

_____

(Authorized signing officer, Title)

SEALED SUBMISSION:

Bid is to be submitted in Duplicate.

Bid is to be submitted in a sealed envelope containing bid and bid form supplements and addressed as follows:

Prime Contract Bid for:
Fort Loramie Local School District Board of Education

END OF BID FORM

SECTION 00 45 21 - CONTRACTOR'S AFFIDAVIT

State of Ohio

County of _____ , ss:

_____(Name) being first duly sworn, deposes and says that he/she is

the _____(Title) of _____(Name of Contractor)

with offices located at _____(Address of Contractor),

and its duly authorized representative, states that effective

the _____ day of _____ 20__ , (date of submission of bid)

_____ (Name of Contractor):

( ) is charged with delinquent personal property taxes on the general list of personal property as set forth below:

County	Amount (include total amount, penalties and interest)
	$
	$
	$
	$

( ) is not charged with delinquent personal property taxes on the general list of personal property in any Ohio county

_____ (Affiant)

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

Seal of Notary

SECTION 00 45 19 - NON-COLLUSION AFFIDAVIT

STATE OF _____

_____

BID Identification

_____

CONTRACTOR

_____, being first duly sworn, deposes and says that they are _____ (sole owner, a partner, president, secretary, etc.) of

_____, the party making the foregoing BID; that such BID is not made in the interest of or on behalf of any undisclosed person, partnership, company, association, organization, or corporation; that such BID is genuine and not collusive or sham: that said BIDDER to put in a false or sham BID, and has not directly or indirectly colluded, conspired, connived, or agreed with any BIDDER or any one else to put in a sham BID, or that any one shall refrain from bidding; that said BIDDER has not in any manner, directly or indirectly, sought by agreement, communication or conference with any one to fix the BID price of said BIDDER or of any other BIDDER, or to fix any overhead, profit, or cost element of such BID price, or of that of any other BIDDER, or to secure any advantage against the OWNER awarding the contract or anyone interested in the proposed contract; that all statements contained in such BID are true; and, further, that said BIDDER has not, directly or indirectly, submitted his BID price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid and will not pay any fee in connection therewith, to any corporation, partnership, company, association, organization, BID depository, or to any member or agent thereof, or to any other individual except to such person or persons as have a partnership or other financial interest with said BIDDER in his general business.

Signed:

_____

(Bidder - print the full name of your firm)
was hereunto affixed in the presence of:

_____

(Authorized signing officer)

_____

(Authorized signing officer, Title)

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

Seal of Notary

SECTION 00 50 00
CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 CONTRACTOR IS RESPONSIBLE FOR OBTAINING A VALID LICENSE TO USE ALL COPYRIGHTED DOCUMENTS SPECIFIED BUT NOT INCLUDED IN THE PROJECT MANUAL.

1.02 AGREEMENT AND CONDITIONS OF THE CONTRACT

A. See Section 00 73 00 - SUPPLEMENTARY CONDITIONS for the Supplementary Conditions.

B. The Agreement is based on AIA A101.

C. The General Conditions are based on AIA A201.

D. See Section 00 73 00 AIA A201 - SUPPLEMENTARY CONDITIONS

1.03 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in Contract Documents.

B. Bond Forms:
   1. Performance and Payment Bond Form: In Compliance with the Ohio Revised Code.

C. Non-Collusion Affidavit: 00 45 19 Non-Collusion Affidavit

D. Contractor's Affidavit: 00 45 21 Contractor's Affidavit

E. Post-Award Certificates and Other Forms:
   1. Contracting Submittal Letter Form: 01 33 23 Contractor Submittal Form.
   2. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).

F. Clarification and Modification Forms:
   1. Request for Interpretation Form: Garmann/Miller Architect and Engineers, Request for Information Form attached following this section.
   2. Architect's Supplemental Instructions Form: AIA G710.
   3. Construction Change Directive Form: AIA G714.
   4. Request for Proposal Form: AIA G709.
   5. Change Order Form: AIA G701.

G. Closeout Forms:
   1. Certificate of Substantial Completion Form: AIA G704.
   2. Conditional Lien Waiver and Release Upon Progress Payment form: Section 00 61 16.

1.04 REFERENCE STANDARDS

A. AIA A101 - Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum; 2007.

B. AIA A201 - General Conditions of the Contract for Construction; 2007.

C. AIA G701 - Change Order; 2001.

D. AIA G702 - Application and Certificate for Payment; 1992.

E. AIA G703 - Continuation Sheet; 1992.

F. AIA G704 - Certificate of Substantial Completion; 2000.

G. AIA G710 - Architect's Supplemental Instructions; 1992.

H. AIA G714 - Construction Change Directive; 2007.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 00 50 00

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor *where the basis of payment is a Stipulated Sum*

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

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

Fort Loramie Local School District Board of Education
575 Greenback Road
P.O. Box 26
Fort Loramie, OH 45845

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

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

Fort Loramie Local Schools Athletic Complex & Associated Improvements
600 East Park Street
Fort Loramie, OH 45845

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

Garmann/Miller & Associates, Inc.
38 S. Lincoln Drive,
P.O. Box 71
Minster, OH 45865

The Owner and Contractor agree as follows.

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

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

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

[ ] The date of this Agreement.

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

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

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

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

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve

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Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

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

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

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

Item	Price

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

Item	Price	Conditions for Acceptance

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

Item	Price

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

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

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

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ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

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

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

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

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

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

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

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

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(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

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

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

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

§ 5.2 Final Payment

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

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

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

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

§ 5.3 Interest

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

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.

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(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[ ] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

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

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

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

§ 8.3 The Contractor's representative:

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(Name, address, email address, and other information)

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

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with a building information modeling exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with a building information modeling exhibit, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 Building information modeling exhibit, dated as indicated below:
(Insert the date of the building information modeling exhibit incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

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Number	Date	Pages

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

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

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

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

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

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

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SECTION 00 61 16 - CONDITIONAL LIEN WAIVER AND RELEASE UPON PROGRESS PAYMENT

Known by all those present:

Upon receipt by the undersigned of a check from the Contractor in the amount of:
$_____

Payable to: _____,

and when the check has been properly endorsed and had been paid by the bank upon which it is drawn, document becomes effective to release and satisfy all lien rights, claims, or demands of any kind whatsoever.

Which the undersigned now has against, Fort Loramie Local School District Board of Education, its successors and assigns on the job site located at: 600 East Park Street, Fort Loramie, Ohio 45845.

This release covers a progress payment for labor, material, and equipment furnished on the 25041.00 Fort Loramie Local Schools Athletic Complex Building & Associated Improvements.

This release is valid through _____ (date of submittal) and does not cover retainage.

The undersigned warrants that they either have already paid or will use the monies they receive from the progress payment, to promptly pay in full for all of the labor, subcontractors, and suppliers for all their work, material, equipment or services provided for or to the: 25041.00 Fort Loramie Local Schools Athletic Complex Building & Associated Improvements, up to the date of this waiver.

Date: _____

Company: _____

Signature: _____

By (name & title): _____

Sworn before me in the State of Ohio, in the County of _____,

subscribed and sworn before me this _____ Day of _____, 20_____.

Notary Republic Signature: _____

Notary Republic Name: _____

My commission expires on: _____

(seal & stamp)

END OF SECTION 00 61 16

GARMANN MILLER

Request for Information

FORM 00 63 13

RFI no. _____

Project name _____
Project location _____
Contractor _____
A/E contact _____

GM project no. _____
Drawing sheet no. _____
Specification section _____
Date answer requested _____

Description of interpretation or clarification needed

Date received _____

Name _____ Phone number _____

Signature _____ Date released _____

A/E Response

Date received _____

Name _____ Phone number _____

Signature _____ Date released _____

Contractor receipt

Upon review of the A/E's response we anticipate the potential contract adjustments indicated to the right:

Date in _____ Date out _____

Name _____

Signature _____ Date _____

- ☐ No change in cost or time
- ☐ Decrease in cost of approx. $_____
- ☐ Increase in cost of approx. $_____
- ☐ Decrease in time of _____ days
- ☐ Increase in time of _____ days

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Minster, OH | Columbus, OH | Indianapolis, IN | Fort Wayne, IN

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

Fort Loramie Local Schools Athletic Complex Building & Associated Improvements
600 East Park Street
Fort Loramie, OH 45845

THE OWNER:
(Name, legal status and address)

Fort Loramie Local School District Board of Education
575 Greenback Road
P.O. Box 26
Fort Loramie, OH 45845

THE ARCHITECT:
(Name, legal status and address)

Garmann/Miller & Associates, Inc.
38 S. Lincoln Drive,
P.O. Box 71
Minster, OH 45865

TABLE OF ARTICLES

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

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

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13 MISCELLANEOUS PROVISIONS

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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

§ 1.8 Building Information Models Use and Reliance

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

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ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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§ 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.

§ 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

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purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

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§ 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.

§ 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,

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

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constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The

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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.

§ 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

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Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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§ 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.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

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§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

- **.1** Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- **.2** Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

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

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

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

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

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§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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whom the Contractor intends to pay.

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

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

§ 9.4 Certificates for Payment

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

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

§ 9.5 Decisions to Withhold Certification

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

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

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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.

§ 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.

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§ 9.10 Final Completion and Final Payment

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

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed

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by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

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

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the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

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

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

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

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

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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.

§ 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.

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

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

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approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

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

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

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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.

§ 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

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

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

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

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

§ 15.4.4 Consolidation or Joinder

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

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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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SECTION 00 73 00 - SUPPLEMENTARY CONDITIONS

MODIFICATIONS TO AIA

These Supplementary Conditions amend or supplement the General conditions of the Contract for Construction (AIA Document A201, 2017 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemental remain in full force and effect.

The terms used in these Supplementary Conditions which are defined in the General Conditions of the Contract of Construction (AIA Document A201, 2017 Edition) have the meanings assigned to them in the General Conditions.

ARTICLE 1 - GENERAL PROVISIONS

Paragraph 1.1 Basic Definitions: Add the following paragraphs

1.1.9 Furnish: The term 'furnish' shall mean to purchase and deliver product to the site ready for installation.

1.1.10 Install: The term 'install' shall mean to take furnished product and assemble, erect, secure in place, connect in operation as applicable.

1.1.11 Provide: The term 'provide' shall mean to furnish and install.

Paragraph 1.2 Correlation and Intent of the Contract Documents:

Add the following paragraph 1.2.1.1

1.2.1.1 In the event of inconsistencies within or between the Contract Documents, the Contractor shall provide the better quality or greater quantity of Work and shall comply with the stricter requirements.

ARTICLE 2 - OWNER

Paragraph 2.1.2.1; Add the following:

The Owner shall prepare a Notice of Commencement for the Project as required by the Ohio Revised Code and provide a copy to the Contractor.

Add paragraph 2.1.3

2.1.3 The Owner shall mean:

Fort Loramie Local School District Board of Education
575 Greenback Road, PO Box 26
Fort Loramie, Ohio 45845

Paragraph 2.3.4: Modify to read

2.3.4 The owner shall not be responsible for furnishing surveys or other information as to the physical characteristics, legal limitations, or utility locations for the Project site, except as included in the Contract Documents. The Contractor shall confirm the location of each utility.

ARTICLE 3 - CONTRACTOR

Article 3.2 Review of Contract Documents and Field Conditions by Contractor.

Add the following paragraph 3.2.2.1

3.2.2.1 If the contractor finds any perceived conflict, error, omission or discrepancy on, or between the drawings, specifications, or any of the contract documents, the contractors, before proceeding with the work, shall submit a request to the architect for an interpretation or clarification, the contractor shall be responsible for the prompt delivery of such request.

The architect shall respond to the requests for interpretation of the contract documents within three (3) business days.

3.2.2.2 Any interpretation of the Contract Documents made by any party other than the architect or in any manner other than writing, shall not be binding and the contractor shall not rely upon any such interpretation.

Article 3.4 Labor and Material

Paragraph 3.4.2 add the following at the end of the paragraph:

See Substitution Procedures in Section 01 60 00 - Product Requirements for additional requirements.

Add Paragraph 3.4.4

3.4.4 During the course of the construction project, the Owner desires to protect its employees, visitors and guests from individuals who may have criminal records. See Section 00 73 19 Criminal Background Check for additional requirements.

Article 3.5 Warranty

Add the following to paragraph 3.5.1

The contractor shall warranty and guarantee that all work is in conformity with the Contract Documents and free from defects in workmanship, materials and equipment for a period of one (1) year in addition to other warranties and guarantees specified in the Contract Documents. The performance bond will remain in effect during the warranty period

The warranty and guarantee time period shall commence on the date that the Certificate of Substantial Completion is issued by the architect unless otherwise provided in writing.

The warranty and guarantee provided in this article shall be in addition to and not limitation of any other warranty and guarantee or remedy provided by law or by the Contract Documents.

Should defects in the work become apparent within the warranty and guarantee period, the owner shall promptly notify the contractor in writing and provide a copy of the notice to the architect. Within ten (10) days of receipt of the notice, the contractor shall visit the project in the company of the owner to determine the extent of the defects and shall promptly repair or replace the defective work, including adjacent work damaged as a result of such defects and as a result of remedying the defects whether or not such adjacent work was originally provided by the contractor. The contractor shall be responsible for the cost of temporary materials or equipment required during the repair or replacement of the defective work.

If the defective work is considered by the Owner to be an emergency, the owner may require the contractor to visit the project within one (1) day of receipt of the notice.

Work which is repaired or replaced by the contractor shall be inspected and accepted by the Owner. The repaired and replaced work shall be guaranteed by the contractor for one (1) year from the date of acceptance by the owner.

Article 3.6 Taxes

Add the following:

The Contractor acknowledges that the Owner is a political subdivision of the State of Ohio or tax exempt organization and is exempt from state sales, use and commercial activity taxes. Upon written request, the Owner will provide the Contractor with an applicable certificate of exemption.

Article 3.7 Permits, Fees and Notices

Omit paragraph 3.7.1 and add the following:

3.7.1 The Owner shall secure and pay for the Certificate of Plan Approval and Plumbing Approval as required by the Ohio Building Code. The owner will pay for the sprinkler and fire alarm fees as required by the Ohio Building Code with the sprinkler contractor and the fire alarm contractor submitting drawings and calculations required

(seven sets minimum) to the architect. The contractor shall secure and pay for all other building permits, tap fees, user fees, and governmental fees, licenses and inspections. The contractor is to verify the exact cost of permits, fees, licenses and inspections. No additional cost or change orders will be permitted because of causal or approximated fees or escalation of fees occurring after award of contract.

Article 3.11 Documents and Samples at the Site

Add the following paragraph 3.11.1

3.11.1 The Contractor shall maintain readily accessible to the authorities having jurisdiction, the Architect, and the Owner drawings, project manual and related documents approved by appropriate building departments and authorities having jurisdiction.

Article 3.12 Shop Drawings, Product Data and Samples

Add the following paragraph 3.12.11

3.12.11 Refer to Section 01 30 00 Administrative Requirements for additional requirements.

Article 3.13 Use of the Site

Add the following paragraphs

3.13.1 Damage to road, features, or the grounds, resulting from hauling, storage of materials, or other activities connected with the work shall be repaired by the contractor at his expense to the satisfaction of the Architect.

3.13.2 The contractor and any entity for whom the contractor is responsible shall not erect any sign at the project site without the consent of the owner.

Article 3.16 Access to Work

Add the following to paragraph 3.16

The contractor shall provide proper facilities for such access and observation.

Add the following paragraph 3.16.1

3.16.1 The Contractor shall provide access to the work in preparation and progress as required for special inspection required by the building department or authority having jurisdiction.

ARTICLE 4 - ARCHITECT

Article 4.1.1

Add the following paragraph 4.1.1.1

4.1.1.1 Architect shall mean: Garmann/Miller and Associates, Inc., 38 South Lincoln Drive, Minster, Ohio 45865

ARTICLE 8 - TIME

Add the following to Article 8.4

8.4.Liquidated Damages

8.4.1 Upon Failure to have all work substantially completed within the time period stated, or failure to have the applicable portion of the work substantially complete upon any milestone date, the Owner shall be entitled to retain or recover from the Contractor, as Liquidated Damages, and not as a penalty, the applicable amount set forth in the following table for each and every calendar day thereafter until Contract Completion, unless an extension of time is granted in accordance with the Contract Documents.

Contract Amount	Dollars per Day
less than $50,000.00	$300.00
More than $50,000.00 to $150,000.00	$500.00
More than $150,000.00 to $500,000.00	$1000,00

More than $500,000.00 to $2,000,000.00	$2,000.00
More than $2,000,000.00 to $5,000,000.00	$3,000.00
More than $5,000,000.00	$4,000.00

8.4.2 The amount of Liquidated Damages is agreed upon by and between the Contractor and the Owner because of the impracticality and extreme difficulty of ascertaining the actual amount of damage the Owner would sustain.

ARTICLE 9 PAYMENT AND COMPLETION

ARTICLE 9.3 - **Applications for Payment**

Add the following to Article 9.3.1

9.3.1.3 The form of Application for Payment will be a notarized AIA Document G702, Application and Certificate for Payment with AIA Document G703, Continuation Sheet. Applications for payment shall be made at approximately 30 day intervals. The contractor shall submit in triplicate the Application for Payment and Continuation Sheet. The Continuation Sheet (G703) shall be prepared the same as the Schedule of Values.

9.3.1.4 Contractor shall submit with each Application for Payment a notarized affidavit that payroll, bills for equipment, material and any other indebtedness connected with the work for which the previous Applications for Payment submitted and the owner might any way be responsible, have been paid. Also, submit release of liens arising out of the contract from each subcontractor, supplier, material person and laborer of the contract.

9.3.1.5 Schedule of Values (AIA Form G703 - Application and Certificate for Payment Continuation Sheet) shall utilize the table of contents of the Project Manual to identify each line item with title and number of the specification Section. Each line item including subcontracted work shall be shown with separate amounts for labor and material.

9.3.1.5.1 Identify on separate line items; Bonds, Insurance, Permits, Allowances, Site Mobilization, and Project Closeout (punch list, attic stock, project record drawings, training, final cleaning).

9.3.1.5.2 If the project is of sufficient size or nature, the Schedule of Values various items shall be subdivided into areas or units when requested by the Architect.

9.3.1.5.3 The architect reserves the right to use the approved Schedule of Values to determine the cost or credit resulting from any changes to the Work.

9.3.1.6 Labor Payments - Partial payments for labor performed under lump sum contract shall be made at the rate of 92 percent of the amount invoiced through the Application for Payment which shows the total contract completion at 50 percent or greater. After the contract is 50 percent complete, as evidenced by payments in the amount at least 50 percent of the labor contract price to the contractor, no additional funds will be retained. Retained funds will be deposited accordance to Paragraph 9.3.1.8

9.3.1.7 Material Payments - Partial payments for materials delivered on the site, or other point in the vicinity of the Project, or otherwise stored, as approved by the Architect, under lump sum contract shall be made at the rate of 92 percent of the amount invoiced. Payment for material incorporated into the project shall be made at the rate of 100 percent of scheduled value. Retained funds will be deposited accordance to Paragraph 9.3.1.8. The balance such invoiced cost shall be paid when such material is incorporated into and becomes part of the Project.

9.3.1.8 All funds retained shall be deposited in an escrow account with a bank in the state in accordance with the term as, and conditions provided in an escrow agreement executed by the contractor, the Owner and the applicable bank.

9.3.1.9 When the project is complete and there exists no other reason to withhold retainage, the retained percentages held in connection with such portions shall, upon request of the contractor, be released from escrow and paid to the contractor, withholding that amount necessary to assure completion. The amount of fund retained to assure completion of the work shall not be less than two (2) times the value of the work as determined by the Architect and Owner.

Add the following to paragraph 9.3.2

9.3.2.1 Where it is to the owner's best interest, materials stored off site will receive payment provided the contractor furnished to the owner with the monthly application for payment the following:

A list of the materials consigned to the project giving the place of storage, together with copies of invoices and reasons why materials cannot be delivered to the site.

Certification that all items are tagged for delivery to the project and that they will not be used for any other purpose.

Evidence of adequate insurance covering the material stored naming the owner as additionally insured.

The owner and architect shall have the right to inspect all materials stored.

When payment is allowed on account of material delivered on the site of the work or in the vicinity thereof or under the possession and control of the contractor but not yet incorporated therein, such material shall become the property of the owner, but if such material is stolen, destroyed, or damaged by casualty before being used, the contractor will be required to replace it at the contractor's expense

Add the following to paragraph 9.3.3

9.3.3.1 No materials or supplies for the work shall be purchased by the contractor or any subcontractor subject to any chattel mortgage, under conditional sale contract or other agreement by which an interest is retained by the seller.

ARTICLE 11 INSURANCE AND BONDS

11.1 - Contractor's Insurance and Bonds

Add the following to Article 11.1.1:

11.1.1.1 A commercial general liability policy and business automobile liability policy, separately or combined, shall be maintained to provide insurance as set forth in paragraph 11.1.1.

11.1.1.2 Such commercial general liability and business automobile liability insurance may be either combined single limits or split limits as provided below. An umbrella or excess liability policy may be used in combination with the commercial general liability and business automobile insurance to meet such limits:

Contracts in the maximum of $100,000 or less shall require coverage in the amount of not less than $1 million general aggregate and per occurrence.

Contracts in excess of $100,000 but not more than $5 million shall require coverage in the amount of not less than $3 million general aggregate and per occurrence.

Such policies shall be endorsed to provide that the general aggregate limit applies separately to each of the insured contractor's projects.

11.1.1.3 If commercial general liability and business automobile liability insurance is written with split limits, the following minimum limits shall be provided:

Contracts in the amount of $100,000 or less shall require coverage in the amount of not less than $500,000 for injuries, including death, to one person, and $1 million per occurrence and $500,000 property damage.

Contracts in excess of $100,000 but not more than $5 million shall require coverage in the amount of not less than $1 million for injuries, including death, to one person, and $1 million per occurrence and $1 million property damage, together with an umbrella or excess liability policy of not less than $2 million per occurrence.

11.1.1.4 For any demolition, blasting, excavating, tunneling, shoring or similar operations, the contractor shall provide and maintain property damage liability insurance with a limit of liability equal to such limit as specified in the application sections of paragraphs 11.1.1.2 and 11.1.1.3.

11.1.1.5 Insurance polices shall be written on an occurrence basis only.

11.1.1.6 Products and completed operation coverage shall commence with the certification of final Certificate of Payment to the Contractor and extend for not less than two years beyond that date.

11.1.1.7 The Owner shall be provided a copy of the policy and named as a certificate holder on the policies of insurance which are maintained by the Contractor. The Owner shall be notified of any change in policy coverage.

Omit paragraph 11.1.2 and substitute the following:

11.1.2 The contractor shall furnish surety bonds covering faithful performance of the contract and payment of obligations arising there under. Cost of surety bonds shall be included in contract sum. The amount of each bond shall be equal to one hundred percent (100%) of the contract sum. Bond shall be in a form in compliance with the Ohio Revised Code 153.57.

11.1.2.1 If at any time the owner for justifiable cause shall be dissatisfied with a surety, or sureties, the contractor shall within five (5) days after notice from the owner, substitute an acceptable bond (or bonds) in such form and sum by another surety or sureties as may be satisfactory to the owner. The premiums on such bond shall be paid by the contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished a acceptable bond to the owner.

11.2 Owners Insurance

11.2.1.1 - Owners Property Insurance Policy (Builders Risk): The Owner shall provide and maintain, during the progress of the work and until the execution of the certificate of substantial completion by the architect, a Property (builder's risk) Insurance Policy to cover all work in the course of construction including falsework, temporary buildings and structures, and materials used in the construction process that are stored on site. Such insurance shall be on a "Risk of Direct Physical Loss" form policy and shall insure against the perils of fire and extended coverage and physical loss or damage including, but not limited to, theft, vandalism, malicious mischief, earthquake, tornado, lightning, explosion, breakage of glass, flood, collapse and water damage. It shall also include debris removal, demolition occasioned by enforcement of an applicable legal requirement, and shall cover reasonable compensation for the state's services and expenses required to limit further loss.

11.2.1.2 - Coverage must include provision to pay the reasonable extra costs of expediting temporary and/or permanent repairs to, or permanent replacement of damaged property. This shall include overtime wages and the extra cost of "express" or other means for rapidly transporting materials and supplies necessary to such repair or replacement.

11.2.1.4 - Coverage for other perils may be required if specified in the special conditions.

Unless otherwise specified in the contract documents, the builder's risk policy shall be written in the amount equal to 100 percent of the contract price, including landscaping, paving and other site work.

11.2.1.5 - The builder's risk policy shall specifically permit and allow for partial occupancy by the owner prior to acceptance of the project by the architect.

11.2.1.6 Property insurance provided by the Owner shall not cover any tools, apparatus machinery, scaffolding, hoist, forms, staging, shoring, and other similar items commonly referred to construction equipment that may be on site and the capital value of which is not included in the Work, nor shall such insurance cover any material or equipment before these materials and equipment are incorporated into the Work. The contractor shall make its own arrangements for any insurance it may require for such construction equipment, materials, and equipment.

ARTICLE 15 - ARBITRATION

15.4 Arbitration: Delete this article. Arbitration is not an acceptable form of binding disputeresolution for this project.

GENERAL NOTES

CONDITIONS PRECEDENT FOR EXECUTION OF AGREEMENT

THE FOLLOWING ITEMS SHALL BE FURNISHED ELECTRONICALLY:

Declaration of Insurance, including property insurance (builders risk)

Ohio Workers Compensation Certificate

A Contract Cost Breakdown Showing itemized Labor & Material amounts for the Total Contract Price

Performance and Payment Bond, Power of Attorney for the bonding agent.

A Certificate of Compliance issued by the Department of Insurance showing the Bonding Co. is licensed to do business in the State of Ohio.

Financial Statement of Bonding Co.

DOCUMENTS REQUIRED AFTER ISSUANCE OF NOTICE TO PROCEED

The architect shall issue a notice to proceed which shall establish the date for commencement of the project time. The contractor will, within 10 days of the date of the Notice to Proceed, furnish the architect ELECTRONICALLY:

A Schedule of Values (AIA Document G703, Continuation Sheet)

A Time Schedule of the Work.

A list of proposed Sub-contractors.

A list of Material Suppliers.

An estimated schedule of monthly payments.

DISCRIMINATION AND INTIMIDATION

The prohibition against discrimination and intimidation on account of race, creed, or color, and the provisions as to forfeitures to be applied in the event of violation of contract regarding same, as contained in sections 153.59 and 153.60, and sections 4112.01 through 4112.99, inclusive, of the Revised Code of Ohio, shall apply to all contracts entered into in conjunction with the work.

END OF SECTION 00 73 00

Fort Loramie Local Schools
Fort Loramie, Ohio

Geotechnical Subsurface Investigation
Proposed New Athletic Building
600 East Park Street
Fort Loramie, Ohio

October 2025

TTL Engineering Services
Geotechnical Engineering
Testing & Inspection Services

1915 North 12th Street
Toledo, OH 43604-5305
T 419-241-4440
www.ttlengservices.com

October 16, 2025

TTL Project No. 250380

Daniel B. Holland, PhD
Fort Loramie Local Schools
575 Greenback Road, PO Box 26
Fort Loramie, Ohio 45845

Geotechnical Subsurface Investigation
Proposed New Athletic Building
600 East Park Street
Fort Loramie, Ohio

Dear Daniel Holland:

Following is the report of the geotechnical subsurface investigation performed by TTL Engineering Services, LLC (TTL) for the referenced project. This study was performed in accordance with TTL Proposal No. 250380, dated August 18, 2025, and was authorized by you on August 25, 2025.

This report of the investigation contains the results of our study, our engineering interpretation of the results with respect to the project characteristics, and our recommendations for design and construction of foundations and floor slabs.

Soil samples collected during this investigation will be stored at our laboratory for 90 days from the date of this report. The samples will be discarded after this time unless you request that they be saved or delivered to you.

Should you have any questions regarding this report or require additional information, please contact our office.

Sincerely,

TTL Engineering Services, LLC

STATE OF OHIO
KATHERINE HENNICKEN
E-83245
REGISTERED PROFESSIONAL ENGINEER

Katherine C. Hennicken, P.E.
Chief Engineer

CC: Mr. Jacob Roberts, AIA, NCARB – Garmann Miller

GEOTECHNICAL SUBSURFACE INVESTIGATION
PROPOSED NEW ATHLETIC BUILDING
600 EAST PARK STREET
FORT LORAMIE, OHIO

FOR

FORT LORAMIE LOCAL SCHOOLS
575 GREENBACK ROAD, PO BOX 26
FORT LORAMIE, OHIO 45845

SUBMITTED

OCTOBER 16, 2025
TTL PROJECT NO. 250380

TTL ENGINEERING SERVICES, LLC
1915 NORTH 12TH STREET
TOLEDO, OHIO 43604
(419) 241-4440

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Logs of Test Borings
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Grain Size Distribution

1.0 INTRODUCTION

This geotechnical subsurface investigation report has been prepared for a new athletic building at the existing Junior/Senior High School located at 600 East Park Street in Fort Loramie, Ohio. The general project area is shown on the attached Site Location Map (Plate 1.0).

This report summarizes our understanding of the proposed construction, describes the investigative and testing procedures, presents the findings, discusses our evaluations and conclusions, and provides our design and construction recommendations for foundations and floor slabs.

This study was performed in accordance with TTL Proposal No. 250380, dated August 18, 2025, and was authorized by Dr. Daniel B. Holland, Superintendent of Fort Loramie Local Schools, on August 25, 2025.

The purpose of this investigation was to evaluate the subsurface conditions and laboratory data relative to the design and construction of foundations and floor slabs at the referenced site. TTL performed eight test borings, field and laboratory soil testing, and a geotechnical engineering evaluation of the test results.

This report includes:

- A description of the subsurface soil and groundwater conditions encountered in the borings.
- Design recommendations for building foundations and floor slabs related to the proposed development.
- Recommendations concerning soil- and groundwater-related construction procedures such as site preparation, earthwork, foundation and floor slab construction, and related field testing.

The scope of this study did not include an environmental assessment of the surface or subsurface materials.

2.0 INVESTIGATIVE PROCEDURES

This subsurface investigation included eight test borings drilled by TTL on September 18 and 19, 2025. The borings were performed within the footprint of the proposed building, and were located in the field by TTL based on a plan drawing provided via email from Garmann Miller on August 18, 2025. The approximate locations of the borings and the proposed development are shown on the Test Boring Location Plan (Plate 2.0).

The test borings were performed in accordance with geotechnical investigative procedures outlined in ASTM Standard D 6151. The test borings performed during this investigation were drilled with a track-mounted Geoprobe® with drilling capabilities utilizing 2¼-inch inside diameter hollow-stem augers. Borings B-1 through B-8 were terminated at the target completion depth of 20 feet below existing grades.

During auger advancement, soil samples were generally collected at 2½-foot intervals to a depth of 10 feet and at 5-foot intervals thereafter. Split-spoon (SS) samples were obtained by the Standard Penetration Test (SPT) Method (ASTM D 1586), which consists of driving a 2-inch outside diameter split-barrel sampler into the soil with a 140-pound weight falling freely through a distance of 30 inches. The sampler was driven in three successive 6-inch increments with the number of blows per increment being recorded. The sum of the number of blows required to advance the sampler the second and third 6-inch increments is termed the Standard Penetration Resistance (N-value) and is presented on the Logs of Test Borings attached to this report. The samples were sealed in jars and transported to our laboratory for further classification and testing.

All samples of the subsoils were visually or manually classified using the Unified Soil Classification System (ASTM D 2487 and D 2488) and tested in the laboratory for moisture content (ASTM D 2216). Dry density determinations and unconfined compressive strength tests by the constant rate of strain method (ASTM D 2166) were performed on selected intact cohesive split-spoon samples. Unconfined compressive strength estimates were performed on the remaining intact cohesive samples using a calibrated hand penetrometer. An Atterberg limits test (ASTM D 4318) and particle size analysis (ASTM D 6913 and D 7928) were performed on a sample from Boring B-8 (SS-1) to determine soil classification and index properties. These test results are presented on the Logs of Test Borings and Grain Size Distribution sheets attached to this report.

Soil conditions encountered in the test borings are presented in the Logs of Test Borings, along with information related to sample data, SPT results, water conditions observed in the borings, and laboratory test data. It should be noted that these logs have been prepared on the basis of laboratory classification and testing as well as field logs of the encountered soils.

Experience indicates that the actual subsoil conditions at a site could vary from those generalized on the basis of test borings made at specific locations, especially at previously developed sites such as this site. Therefore, it is essential that a geotechnical engineer be retained to provide soil engineering services during the site preparation, excavation, and foundation phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations, and to allow design changes in the event subsurface conditions differ from those anticipated prior to the start of construction.

3.0 PROPOSED CONSTRUCTION

It is our understanding that the project consists of construction of a new athletic building at the existing Junior/Senior High School located at 600 East Park Street in Fort Loramie, Ohio. We anticipate that the building will be a single-story, slab-on-grade structure, approximately 25,000 square feet in plan. Structural loads are assumed to be light to moderate in magnitude. Maximum column loads are assumed to be 150 kips and maximum wall loads are assumed to be 3,000 pounds per lineal foot (plf).

Final site grades are assumed to approximate existing site grades.

4.0 GENERAL SITE AND SUBSURFACE CONDITIONS

4.1 General Site Conditions

At the time of our investigation, the site consisted of grass fields, with portions of the site in an existing asphalt parking lot.

The surface materials encountered in each of the borings (except Boring B-6) consisted of topsoil, generally on the order of 2 to 5 inches in thickness. Underlying the topsoil in Boring B-4, approximately 4 inches of crushed stone was encountered.

The surface materials encountered in Boring B-6 consisted of asphalt approximately 4 inches in thickness, underlain by crushed stone approximately 32 inches in thickness. Within the crushed stone, an SPT N-value of 6 blows per foot (bpf), indicating **loose** compactness, and a moisture content of 5 percent were determined.

Underlying the crushed stone in Boring B-6, cohesive existing **fill** materials were encountered to a depth of 7 feet below existing grade. The cohesive fill materials consisted of sandy lean clay. Non-soil materials within the existing fill consisted of crushed stone, in trace quantities. An SPT N-value of 0 blows per foot (sampler advanced 18 inches by the weight of the tools and/or hammer) was determined for one sample obtained within the fill, indicative of **soft** consistency. A moisture content of 19 percent was determined for the tested sample.

4.2 General Soil Conditions

Based on the results of our field and laboratory tests, the subsoils encountered underlying the topsoil and existing fill materials consisted of predominantly stiff to very stiff native cohesive soils. Each of the borings were terminated within these soils at a depth of 20 feet below existing grade. The cohesive soils consisted of lean clay (CL). SPT N-values typically ranged from 9 to 30 blows per foot (bpf), with occasional higher and lower SPT N-values. Within Boring B-7, an SPT N-value of 4 bpf and was determined for the sample zone representative of 3 to 6 feet below existing grade, indicative of soils bordering on **soft** consistency. Unconfined compressive strengths typically ranged from 2,605 to 8,000 pounds per square foot (psf) or greater. Moisture contents ranged from 9 to 23 percent. A liquid limit of 30 percent and plasticity index of 12 percent were determined for a sample obtained from this stratum in Boring B-8 (SS-1). These values, along with gradation results, are indicative of lean clay (CL) as determined in accordance with the Unified Soil Classification System (USCS).

Occasional zones of granular soils were encountered throughout the soil profile. The granular soils consisted of poorly graded sand (SP) as well as clayey sand (SC). An SPT N-value of 16 bpf, indicative of medium dense compactness, was determined for the granular soil zone in Boring B-5 (SS-6).

Additional descriptions of the stratigraphy encountered in the borings are presented on the Logs of Test Borings.

4.3 Groundwater Conditions

Groundwater was encountered during drilling in five of the eight borings at depths ranging from 7 to 19 feet below existing grade. Groundwater was not encountered during drilling or observed upon completion of drilling operations in any of the remaining borings. It should be noted that each boring was drilled and backfilled within the same day. As such, stabilized water levels may not have occurred over this limited time period. Instrumentation was not installed to observe long-term groundwater levels.

Based on soil characteristics and moisture conditions encountered in the borings, it is our opinion that the "normal" groundwater level will generally be encountered at depths of approximately 12 to 14 feet below existing grade. It should be noted that groundwater elevations can fluctuate with seasonal and climatic influences. In particular, "perched" groundwater may be encountered within crushed stone or fill materials underlain by relatively impermeable native cohesive soils. Therefore, the groundwater conditions at the site may vary at different times of the year from those encountered during this investigation.

5.0 DESIGN RECOMMENDATIONS

The following conclusions and recommendations are based on our understanding of the proposed construction and on the data obtained during the field investigation. If the project information or location as outlined is incorrect or should change significantly, a review of these recommendations should be made by TTL. These recommendations are subject to the satisfactory completion of the recommended site and subgrade preparation and fill placement operations described in Section 6.0, "Construction Recommendations."

5.1 Shallow Building Foundations

Based on the results of the field and laboratory testing for the boring performed in the general area of the proposed building footprint, foundation excavations at a depth of 32 inches (minimum required depth for protection from frost penetration) and shallower interior foundation excavations are anticipated to encounter existing **fill** materials as well as predominantly stiff to very stiff native cohesive soils. The native cohesive soils are considered generally suitable for the proposed development. It should be noted that a zone of **soft** cohesive soils were encountered in Boring B-7 from 3 to 6 feet below existing grade. Where existing fill materials or soft cohesive soils are encountered at the foundation subgrade elevation, they must be over-excavated and replaced with new engineered fill as described below.

Following the satisfactory completion of the site preparation and footing excavation inspections outlined in Section 6.0 of this report, the proposed structure may be supported on a conventional shallow spread foundation system consisting of wall (strip) and/or column (square) footings. Shallow foundations may be designed utilizing a net allowable bearing pressure of 2,500 pounds per square foot (psf). In using a net allowable soil pressure, the weight of the footings, backfill over the footings or floor slabs need not be included in the structural loads for dimensioning footings. The bearing materials should be field-verified as being native lean clays (CL) exhibiting an unconfined compressive strength of 2,500 psf or greater, or properly placed and compacted new engineered fill.

Due to the existing site development, we strongly recommend that the bearing surface at the bottom of all footing excavations be inspected during construction by a TTL geotechnical engineer or qualified representative. Inspection should be performed to verify that the exposed soil conditions at the bearing elevations are consistent with the subsurface conditions encountered in the test borings, and that new engineered fill is properly placed and compacted for suitable foundation bearing. Additionally, the presence of our engineer will help facilitate the timely remediation of unsuitable soil conditions. If the results of hand penetrometer or other strength tests

indicate the exposed soil conditions are not suitable for the design bearing pressure, it may be necessary to increase the footing size to accommodate the lower bearing strengths or to over-excavate and backfill with engineered fill or flowable fill.

Where existing fill materials or soft cohesive soils are encountered, or if unsuitable foundation soils are encountered, over-excavation should extend through these materials to suitable bearing soils. The base of the over-excavation should be widened one foot for every foot of depth and centered along the footing. The over-excavated areas should be backfilled with dense-graded aggregate, placed in controlled lifts, and compacted to not less than 100 percent of the maximum dry density as determined by ASTM D 698 (Standard Proctor). Alternatively, the over-excavated areas could be backfilled with lean concrete having a minimum compressive strength of 1,500 pounds per square inch (psi) or other flowable controlled-density fill having a minimum compressive strength of 300 psi. If foundations will be placed at the base of the over-excavation or the lean concrete fill option will be utilized, widening the footing over-excavation will not be required. If the controlled-density fill option is utilized, the footing over-excavation shall be widened as discussed above.

All exterior footings and footings in unheated areas should be constructed at a minimum frost penetration depth of 32 inches below finished exterior grades. Interior footings may bear at a convenient depth below the floor slab, provided they are supported on suitable native cohesive soils as described above or engineered fill. Wall (strip) footings should be at least 18 inches wide and column (square) footings should be at least 30 inches square, regardless of sizing based on design loads and the allowable bearing pressure.

Utilizing the above bearing pressures, proper foundation inspection techniques, a maximum column load of 150 kips, and final site grades approximating existing site grades, the total settlement associated with the structure should not exceed 1 inch and differential settlement should not exceed ¾ inch.

5.2 Seismic Considerations

We have reviewed seismic design parameters in accordance with Ohio Building Code (OBC) criteria, as well as the data obtained during this investigation. It should be noted that the OBC seismic site characterization is based on the upper 100 feet of the geologic profile. Borings performed for this investigation were terminated at a maximum depth of 20 feet. Therefore, our evaluation was limited to a depth of 20 feet.

The average SPT N-value was calculated to be less than 15 blows per foot (bpf) for the encountered soils. These characteristics are indicative of a Site Class E, "soft soil" profile, designation in accordance with OBC criteria, which references ASCE 7-22 Table 20.3-1.

If a Site Class E designation will be restrictive to structural design, it may be prudent to perform deeper SPT borings for seismic site class evaluations, to determine if a better site class designation is appropriate. However, there is no guarantee that such testing would yield a more favorable site class designation.

An alternate method to evaluate seismic site class incorporates shear wave velocity. Development of a shear wave velocity profile is typically performed in conjunction with down-hole or cross-hole seismic testing, which would require additional boreholes and specialized testing equipment. It should be noted that shear wave velocity testing is comparatively costly and, like the deeper SPT borings, there is no guarantee that such testing would yield a more favorable site class designation.

Using seismicmaps.org, based on interpolation from ASCE 7-22 Figures 22-1 and 22-2, were determined as follows:

- S_s (mapped spectral acceleration for short periods) = 0.3g, and
- S_1 (mapped spectral acceleration for 1-sec period) = 0.082g, where acceleration is expressed as a ratio of gravitational acceleration (g).

Using these mapped spectral accelerations, the site coefficients and response accelerations were determined based on ASCE 7-22 Section 11.4 for Site Class E, as follows:

Table 5.2. Site Coefficients/Spectral Response Acceleration Parameters	**Site Class E**
S_{MS} (maximum considered earthquake spectral response acceleration for 0.2-second period)	0.27
S_{M1} (maximum considered earthquake spectral response acceleration for 1-second period)	0.16
S_{DS} (5 percent damped design spectral response acceleration at short periods): $S_{DS} = 2/3\ S_{MS}$	0.18
S_{D1} (5 percent damped design spectral response acceleration at 1-second period): $S_{D1} = 2/3\ S_{M1}$	0.11

These parameters may be used by the structural engineer to develop the design response spectrum in accordance with ASCE 7-22 Section 11.4.5, along with the fundamental period (T, in seconds) of vibration of the structure(s). Based on the response accelerations determined for the site location, and the criteria provided in ASCE 7-22 Tables 11.6-1 and 11.6-2 for Occupancy Category II, a Seismic Design Category B would apply for a Site Class E designation.

5.3 Subgrades

5.3.1 Existing Subgrade

The subgrades that would result upon the satisfactory completion of the site preparation as described in Section 6.0 of this report are considered generally suitable for support of the proposed floor slabs. Based on field and laboratory data developed during this investigation, the subgrade soils consist of predominantly native cohesive soils as well as cohesive existing fill materials. Additionally, subgrades may consist of new engineered fill utilized to achieve design grades after stripping of topsoil. Laboratory analyses for Boring B-8 (SS-1), as well as visual descriptions of the upper soil profile, indicate that the cohesive subgrade soils may be generally classified as Group A-6a in accordance with the Ohio Department of Transportation (ODOT) system of soil classification. The cohesive soils are considered fair to poor as subgrade materials because they have relatively low permeabilities and a high percentage of silt and clay particles, which makes them susceptible to moisture, frost penetration, and frost heave.

At the time of this investigation, moisture contents in the upper 2½ feet of the cohesive subgrade soils generally ranged from approximately 10 to 23 percent. These moisture contents are estimated to vary from somewhat below to significantly above the expected optimum moisture content for these soils. Therefore, it is anticipated that remedial action will be required to adjust the moisture contents of the existing materials to achieve proper compaction of the subgrade.

5.3.2 Modified Subgrade

If soils are dry of optimum, water should be uniformly mixed into the subgrade. If soils wet of optimum are encountered, lowering the moisture content by scarification and aeration (discing and exposure to sun and wind) may be required. However, this may not be feasible if construction occurs during wet seasonal conditions. Very moist to wet soils will “pump” under the operation of heavy equipment, resulting in deep rutting and perhaps rendering the operation of grading and paving equipment difficult or impossible.

Therefore, other methods of subgrade modification may be required in areas of high moisture content. Modification may be achieved by undercutting and replacement with granular subbase (possibly in combination with a geotextile separation layer or geogrid reinforcement), mixing stone into the subgrade, or treating the subgrade with cement. The method of subgrade modification should be determined at the time of construction (See Section 6.1, “Construction Recommendations - Site and Subgrade Preparation”).

5.4 Floor Slabs

It is recommended that all floor slabs be “floating”, that is, fully ground supported and not structurally connected to walls or foundations. This is to reduce the possibility of cracking and displacement of the floor slabs because of differential movements between the slab and the foundation. Such movements could be detrimental to slabs that are rigidly connected to the foundations. There may be certain areas where it will be difficult or impractical to make the slab floating. In such areas, it may be necessary to increase the slab thickness and reinforcement to prevent the foundation from cracking the slab and settling independently.

For properly prepared Group A-6a or better subgrade soils, a modulus of subgrade reaction (k) of 135 pounds per cubic inch (pci) may be used for floor slab design. If cohesive soils are utilized to achieve floor slab subgrade elevation, a lower k-value would be required for design. It is recommended that the floor slab be supported on a minimum 6-inch layer of relatively clean granular material such as sand and gravel or crushed stone. This is to help distribute concentrated loads and provide more uniform subgrade support beneath the slab.

5.5 Groundwater Control and Drainage

As stated previously, groundwater was encountered during drilling in five of the eight borings at depths ranging from 7 to 19 feet below existing grade. Groundwater was not encountered during drilling or observed upon completion of drilling operations in any of the remaining borings. Based on the soil characteristics and moisture conditions encountered during this investigation, it is our opinion that the “normal” long-term groundwater level will generally be encountered at depths of approximately 12 to 14 feet below existing grades.

It is our experience that adequate control of groundwater seepage, perched water, or surface water run-off into shallow excavations in predominantly clay profiles should be achievable by minor dewatering systems, such as pumping from prepared sumps. However, due to the encountered granular soil zones, groundwater control for excavations below a depth of 12 feet may require installation of well points in addition to pumping from prepared sumps. The type of dewatering system utilized will depend on construction practices, soil conditions encountered in the excavations, seasonal conditions, and the depth of excavation. Additionally, the contractor will need to exercise diligence to control seepage and runoff to maintain a stable subgrade. Installation of utilities early in the site development may also alleviate unstable subgrade conditions. In the event excessive seepage is encountered during construction, TTL may be notified to evaluate whether other dewatering methods are required.

5.6 Pipe Support

Based on the conditions encountered in the borings, underground utility inverts are anticipated to bear in predominantly stiff to very stiff native cohesive soils, although occasional zones of granular soils may be encountered. These soils are considered generally suitable for the support of the underground utilities, provided sufficient bedding and haunching material is maintained below and above the utility lines at all locations. However, loose granular soils will require in-place densification using a backhoe-mounted vibratory compactor (hoe-pac) or similar equipment, or removal and replacement with new engineered fill as described below.

Bedding and haunching materials should conform to pipe manufacturer specifications and recommendations. In the absence of specific criteria for bedding and haunching materials, we recommend the use of dense-graded aggregate meeting Ohio Department of Transportation (ODOT) Item 304 specifications, or alternately, ODOT 703 coarse aggregate meeting No. 57 or No. 6 gradations.

Diligent dewatering will be required where excavations extend below the groundwater depth in granular soils. If saturated soils are encountered, overexcavation and replacement with a coarse, open-graded aggregate may be required to provide a stable base for support of the utilities.

Where granular soils cannot be suitably re-compacted in-place, or if other unsuitable soils are encountered at the invert elevations, they should be undercut to firm subgrade conditions. As a minimum, unsuitable soils should be undercut to a depth of one pipe diameter below invert, or 12 inches, whichever is greater. The undercut zones should be replaced with engineered fill, properly placed and compacted as outlined in Section 6.2 of this report prior to placement of the bedding and haunching material.

Along the underground utility alignment, we recommend that the trench excavation at the invert elevation of the underground utility be inspected by a TTL geotechnical engineer or qualified representative. This is to confirm that the pipe bearing soils are consistent with those encountered in the test borings, and that the exposed materials are capable of supporting the underground utilities and/or that engineered fill has been properly placed and compacted.

5.7 Excavations and Slopes

The sides of temporary excavations for building foundations, utility installations, and other construction should be adequately sloped to provide stable sides and safe working conditions. Otherwise, the excavation must be properly braced against lateral movements. In any case,

applicable Occupational Safety and Health Administration (OSHA) safety standards must be followed.

It is the responsibility of the installation contractor to develop appropriate installation methods and specify pertinent equipment prior to commencement of work, and to obtain the services of a geotechnical engineer to design or approve sloped or benched excavations and/or lateral bracing systems as required by OSHA criteria.

Construction traffic and excavated material stockpiles should be kept away from the edge of excavations at a minimum distance equal to the full depth of the excavation. In all cases, pertinent Occupational Safety and Health Administration (OSHA) requirements (Part 1926, Subpart M, Amended 1989) must be followed and adequate protection for workers must be provided.

The construction excavations should not be left open any longer than necessary. As soon as a section is completed, the area should be backfilled to final grade. For underground utility excavations, after the specified bedding material has been placed below and around the pipe, suitable excavated material may be used to backfill the trench. Fill must meet the requirements of Section 6.2 of this report.

5.7.1 Open-Cut Underground Utility Installation

Based on the conditions encountered in the borings, underground utility inverts are anticipated to bear in predominantly stiff to very stiff native cohesive soils, although occasional zones of granular soils may be encountered. Depending on the pipe invert depth, installation may be required in granular soils below seasonal high groundwater conditions or the “normal” groundwater table. If trenches will be open for any significant period, provisions should be made for the utility installation to proceed with properly designed and installed lateral bracing, portable trench boxes, or sliding trench shields. Additionally, it may be necessary to augment sump-and-pump systems with temporary wellpoints in order to control groundwater seepage into the excavation. Additional discussion concerning groundwater management can be found in Section 5.5.

If the excavation is to be performed with sloped banks, adequate stable slopes must be provided. The soils encountered in the test borings are classified as the following OSHA Type soils:

- Type A soils (cohesive soils with unconfined compressive strengths of 3,000 pounds per square foot (psf) or greater),
- Type B soils (cohesive soils with unconfined compressive strengths greater than 1,000 psf but less than 3,000 psf), and
- Type C soils (existing fill materials and granular soils).

For temporary excavations in Type A, B, and C soils, side slopes must be no steeper than ¾ horizontal to 1 vertical (¾H:1V), 1H:1V, and 1½H:1V, respectively. For situations where a higher strength soil is underlain by a lower strength soil and the excavation extends into the lower strength soil, the slope of the entire excavation is governed by that required for the lower strength soil. In all cases, flatter slopes may be required if lower strength soils or adverse seepage conditions are encountered during construction.

If a portable trench box or a sliding trench shield system is utilized, vertical side slopes may be used up to 18 inches below the top of the shield. The sides should be sloped from that point to the ground surface in accordance with the criteria presented in the preceding paragraph.

5.7.2 Foundation Excavations

Based on the soil conditions encountered in the test borings, shallow excavations for foundation installation are anticipated to encounter predominantly new engineered fill, presumed to be cohesive soils that can be trench excavated to form foundation concrete without the need for construction separate forms. Although granular soil zones were not encountered within the borings at the foundation elevation, if they are encountered or if granular engineered fill is utilized to raise site grades, forming of footings and backfilling around CMU or poured foundation walls should be anticipated.

Temporary excavations should be sloped based on the encountered soil type as discussed in Section 5.7.1.

5.7.3 Final Grading Slopes

For permanent excavations and slopes, we recommend that grades be no steeper than 3H:1V without a more extensive geotechnical evaluation of the proposed construction plans and site conditions.

6.0 CONSTRUCTION RECOMMENDATIONS

6.1 Site and Subgrade Preparation

Prior to proceeding with construction operations, all structures, vegetation, topsoil, root mat, and other deleterious non-soil materials should be removed from the proposed construction areas. Suitable topsoil may be stockpiled for later use in landscaped areas. It is important to note that topsoil thicknesses referenced in the borings may vary across the site, particularly due to the agricultural land use associated with the site. Typically, soils with more than 5 percent organics are not recommended as subgrade soils in structure areas, but dark colored soils having the appearance of topsoil with only trace "root hairs" of 5 percent or less may not necessarily require stripping. For these "transitional" soils, the actual moisture content and subgrade stability under proof-rolling operations is more critical than the color in determination of the amount of stripping or subgrade undercut. The actual amount of required stripping should be determined in the field by a geotechnical engineer or qualified representative.

Due to the existing development at the site, the proof rolling and preparation of this site will require careful inspection. Voids remaining after utility trench abandonment, as well as other exposed excavations, should be backfilled with engineered fill, placed in controlled lifts and tested for suitable compaction in accordance with the criteria in Section 6.2 of this report. If such excavations are randomly filled or graded without compaction control, excessive differential settlement could occur.

Upon completion of stripping and clearing, the areas intended to support floor slabs and new fill should be carefully inspected by a geotechnical engineer. At that time, the engineer may require proof rolling utilizing a 20- to 30-ton loaded truck or other pneumatic-tired vehicle of similar size and weight. The truck should make a minimum of two passes covering the proposed development area, with additional passes as necessary to achieve required compaction and/or subgrade stabilization. The purpose of proof rolling the cohesive subgrades is to locate any weak, soft, or excessively wet soils that may be present at the time of construction.

Any unsuitable materials observed during the inspection and proof-rolling operations should be undercut and replaced with compacted fill or stabilized in place utilizing conventional remedial measures such as discing, aeration, and recompaction. Depending on construction season and schedule allowances, it may be more practical, economical, and time-saving to utilize lime stabilization to remediate the subgrade. Once the site has been proof rolled, inspected, and stabilized, the proof-rolled or inspected subgrades should not be exposed to wet conditions. It

should be recognized that during periods of wet weather, the silty and clayey soils that will be exposed at design subgrades will tend to pond water for short periods of time, with the potential to deteriorate the prepared subgrade.

The results of the inspection and proof-rolling operations will be partially dependent on construction operations, the moisture content of the soil, and the weather conditions prevalent at the time. If pumping or rutting is encountered and difficulty is experienced in the operation of construction equipment, TTL should be notified in order to determine which method of subgrade modification may be best suited for the conditions encountered. Should such conditions be experienced, we may recommend that a small test area be used to determine the necessary depth of undercutting and stone replacement or other remedial action necessary to achieve a stable subgrade condition.

6.2 Fill

Material for engineered fill or backfill required to achieve design grades may consist of any non-organic soils having a maximum dry density as determined by the Standard Proctor (ASTM D 698) of 90 pounds per cubic foot (pcf) or greater. To maintain the recommended subgrade support value (k-value) presented in this report, new engineered fill within 36 inches of subgrade elevation should consist of ODOT A-6a or better soils. On-site soils may be used as engineered fill materials provided that they are free of organic matter, debris, excessive moisture, and rock or stone fragments larger than 3 inches in diameter. Depending on seasonal conditions, the on-site soils may be wet of optimum and may require scarification and aeration to achieve satisfactory compaction. If the construction schedule does not allow for scarification and aeration activities, it may be more practical or economical to utilize imported granular fill.

Fill should be placed in uniform layers no more than 8 inches thick (loose measure) and adequately keyed into stripped and scarified soils. All fill within the building areas should be compacted to not less than 100 percent of the maximum dry density as determined by ASTM D 698 (Standard Proctor).

The upper soil profile at the site consists of native cohesive soils as well as cohesive existing fill materials. The contractor should be prepared to use a sheepsfoot roller to provide effective compaction of the cohesive soils and existing fill materials. If imported granular soils are utilized as engineered fill, a vibratory smooth-drum roller should be utilized for compaction. In narrow utility or footing excavations, the on-site cohesive soils may be difficult to compact; therefore, a clean granular material may be required in these areas.

Scarified subgrade soils and all fill material should be within 3 percent of the optimum moisture content to facilitate compaction. Furthermore, fill material should not be frozen or placed on a frozen base. It is recommended that all earthwork and site preparation activities be conducted under adequate specifications and properly monitored in the field by a qualified geotechnical testing firm.

6.3 Foundation Excavations

As mentioned in Section 5.1, foundation excavations should have a detailed footing inspection performed for each foundation. A geotechnical engineer or qualified representative should perform these inspections to verify that the exposed materials are similar to those encountered in the borings and that engineered fill has been properly placed and compacted such that it is capable of supporting the design bearing pressure.

We recommend that the foundation excavations be concreted as soon as practical after they are excavated and that water not be allowed to pond in any excavation. If it is necessary to leave the bearing surface open for any extended period of time, we recommend that a thin mat of lean concrete be placed over the bottom of the excavation to reduce damage to the surface from weather or construction. Foundation concrete should not be placed on frozen or saturated subgrade.

Additional foundation subgrade inspection and preparation recommendations are provided in Section 5.1.

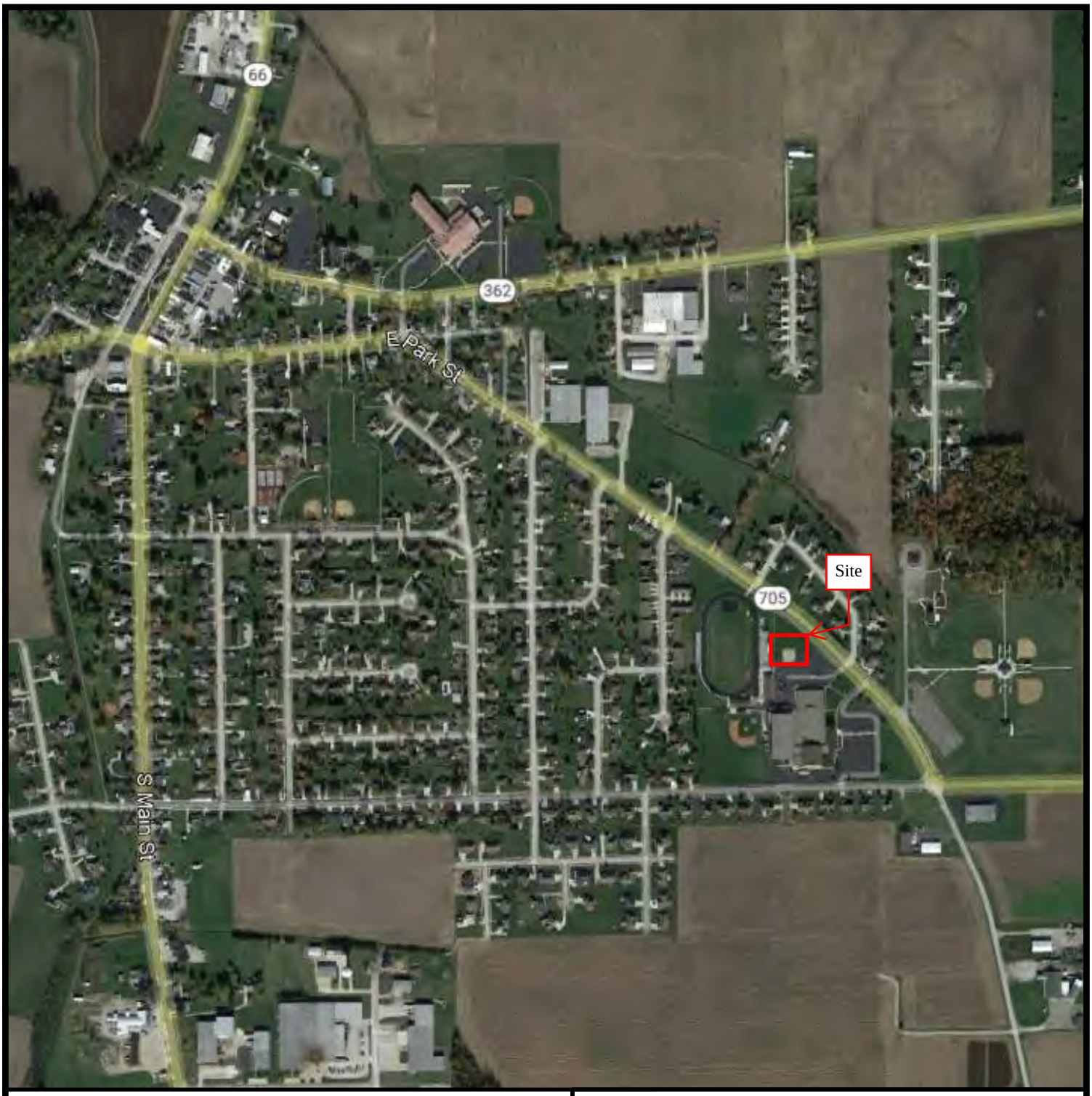
7.0 QUALIFICATION OF RECOMMENDATIONS

Our evaluation of foundation and floor slab design and construction conditions has been based on our understanding of the site and project information and the data obtained during our field investigation. The general subsurface conditions used were based on interpretation of the subsurface data obtained in widely-spaced borings. Regardless of the thoroughness of a subsurface investigation, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. This potential is increased at previously developed sites. Therefore, experienced geotechnical engineers should observe earthwork and foundation construction to confirm that the conditions anticipated in design are noted. Otherwise, TTL assumes no responsibility for construction compliance with the design concepts, specifications, or recommendations.

The design recommendations in this report have been developed on the basis of the previously described project characteristics and subsurface conditions. If project criteria or locations change, a qualified geotechnical engineer should be permitted to determine whether the recommendations must be modified. The findings of such a review will be presented in a supplemental report.

The nature and extent of variations between the borings may not become evident until the course of construction. If such variations are encountered, it will be necessary to reevaluate the recommendations of this report after on-site observations of the conditions.

Our professional services have been performed, our findings derived, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. TTL is not responsible for the conclusions, opinions, or recommendations of others based on this data.



LEGEND

APPROXIMATE SITE LOCATION

Note: Aerial imagery obtained from Google Earth.

N

APPROXIMATE SCALE – FEET

0 750 1,500

Site Location Map

Proposed New Athletic Building
600 East Park Street
Fort Loramie, Ohio

PREPARED FOR

Fort Loramie Local Schools
Fort Loramie, Ohio

DRAWN KCH/09-19-25	CHECKED
REVISED	APPROVED
JOB NO. 250380	
DRAWING NUMBER Plate 1.0	

TTL Engineering Services

B-1

B-2

B-3

B-4

B-5

B-6

B-7

B-8

EX. ELECTRIC EASEMENT
MISC. 20, PG. 248

EX. CB #12
TOP 957.17
12" N INV 950.92
12" S INV 950.92

12" RCP

CONC. PVMT.

GATE

EX. S/W

STATE ROUTE 705

B.M. #2

EX. CB #7
TOP 957.05
12" NE INV
954.25
18" SE INV
954.38
8" SW INV 954.38

12" CPSLP

TWO DIFFERENT MATERIALS DIPPED

GRAVEL PVMT.

ASPHALT

SAN MH #6
TOP 958.07
6" SE INV
952.62
6" NW INV

EX. CB #11
TOP 957.22
12" N INV 951.47
10" E INV 952.16
12" SW INV
951.47

BRICK COLUMN

10" CPSLP

ASPHALT PVMT.

Note: Aerial imagery obtained from Google Earth. Base drawing provided via email from Garmann Miller on August 18, 2025

N

LEGEND

B-1 APPROXIMATE TEST BORING LOCATION

APPROXIMATE SCALE – FEET

0 30 60

Test Boring Location Plan

Proposed New Athletic Building
600 East Park Street
Fort Loramie, Ohio

PREPARED FOR
Fort Loramie Local Schools
Fort Loramie, Ohio

DRAWN KCH/09-19-25	CHECKED
REVISED	APPROVED
JOB NO. 250380	
DRAWING NUMBER Plate 2.0	

TTL Engineering Services

TTL Engineering Services, LLC
1915 North 12th Street
Toledo, Ohio 43604
Telephone: 419-241-4440

BORING NUMBER B-1

CLIENT Fort Loramie Local Schools
PROJECT NAME Proposed New Athletic Building
PROJECT NUMBER 250380
PROJECT LOCATION Fort Loramie, OH
DRILLING CONTRACTOR TTL Engineering Services, LLC CW BH
RIG NO. 7822 DT
GROUND ELEVATION
DRILLING METHOD 2-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 9/19/25 **COMPLETED** 9/19/25
AT TIME OF DRILLING 14.1 ft
LOGGED BY CW **CHECKED BY** KCH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 4 Inches						
			0.3'						
			Moist Stiff to Very Stiff Brown SANDY LEAN CLAY w/Trace Gravel and Organics (CL)	SS 1	67	3-4-5 (9)	4.00		10
			3.5'						
	5		Moist Very Stiff to Hard Gray/Brown LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL)	SS 2	83	6-9-13 (22)	6.08	115	11
			@6.3': Brown	SS 3	89	13-14-16 (30)	>4.5		
			8.5'						
	10		Moist Stiff Gray/Brown LEAN CLAY w/Sand and Trace Gravel (CL)	SS 4	83	4-6-9 (15)	>4.5		15
			14.1'						
	15		Moist Medium Dense Gray POORLY GRADED SAND w/Trace Gravel and Silt (SP)	SS 5	100	5-8-9 (17)	4.25		
			14.3'						
			Moist Very Stiff to Hard Gray LEAN CLAY w/Sand and Trace Gravel (CL)						
			18.5'						
	20		Moist Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 6	100	5-5-7 (12)	>4.5		14
			20.0'						
			Bottom of hole at 20.0 feet.						

TTL_GEOTECH_STANDARD 250380(TTL).GPJ GINT US LAB.GDT 10/16/25

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BORING NUMBER B-2

CLIENT Fort Loramie Local Schools
PROJECT NAME Proposed New Athletic Building
PROJECT NUMBER 250380
PROJECT LOCATION Fort Loramie, OH
DRILLING CONTRACTOR TTL Engineering Services, LLC CW BH
RIG NO. 7822 DT
GROUND ELEVATION
DRILLING METHOD 2-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 9/19/25 **COMPLETED** 9/19/25
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** KCH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 4 Inches						
			0.3'						
			Moist Stiff Brown LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL)	SS 1	89	5-5-5 (10)	>4.5		14
			3.8'						
	5		Moist Very Stiff to Hard Brown LEAN CLAY w/Sand and Trace Gravel (CL)	SS 2	83	7-11-11 (22)	>4.5		14
				SS 3	83	13-13-13 (26)	>4.5		
			8.5'						
	10		Moist Stiff to Very Stiff Gray/Brown LEAN CLAY w/Sand and Trace Gravel (CL)	SS 4	100	6-7-8 (15)	2.88	110	17
	15		@13.5': Stiff, Brown/Gray	SS 5	100	3-7-8 (15)	>4.5		
			16.0'						
			Moist Medium Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 6	100	3-3-5 (8)	4.00		15
	20		20.0'						
			Bottom of hole at 20.0 feet.						

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BORING NUMBER B-3

CLIENT Fort Loramie Local Schools
PROJECT NAME Proposed New Athletic Building
PROJECT NUMBER 250380
PROJECT LOCATION Fort Loramie, OH
DRILLING CONTRACTOR TTL Engineering Services, LLC CW BH
RIG NO. 7822 DT
GROUND ELEVATION
DRILLING METHOD 2-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 9/18/25 **COMPLETED** 9/18/25
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** KCH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 3 Inches						
			0.3'						
			Moist Stiff Brown SANDY LEAN CLAY w/Trace Gravel and Organics (CL)	SS 1	44	3-4-5 (9)	NI		9
			3.5'						
	5		Moist Medium Stiff Gray/Brown LEAN CLAY w/Sand and Trace Gravel (CL)	SS 2	78	6-2-3 (5)	0.59	101	23
			6.0'						
			Moist Stiff Gray/Brown LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL)	SS 3	89	3-5-5 (10)	4.25		
			@8.5': Brown/Gray	SS 4	100	3-5-7 (12)	>4.5		17
	10								
				SS 5	100	5-7-8 (15)	>4.5		
	15								
			@16': Stiff to Very Stiff, Gray						
				SS 6	100	3-5-7 (12)	3.05	114	15
	20		20.0'						
			Bottom of hole at 20.0 feet.						

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Telephone: 419-241-4440

BORING NUMBER B-4

CLIENT Fort Loramie Local Schools
PROJECT NAME Proposed New Athletic Building
PROJECT NUMBER 250380
PROJECT LOCATION Fort Loramie, OH
DRILLING CONTRACTOR TTL Engineering Services, LLC CW BH
RIG NO. 7822 DT
GROUND ELEVATION
DRILLING METHOD 2-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 9/19/25 **COMPLETED** 9/19/25
AT TIME OF DRILLING 13.7 ft
LOGGED BY CW **CHECKED BY** KCH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 4 Inches 0.3'						
			Moist Stiff Brown SANDY LEAN CLAY w/Trace Gravel and Organics (CL)	SS 1	83	3-4-5 (9)	NI		15
			3.0'						
			Moist Stiff Gray/Brown LEAN CLAY w/Sand and Trace Gravel (CL) 4.3'	SS 2	83	3-5-5 (10)	>4.5		
	5		Moist Loose Brown POORLY GRADED SAND w/Trace Gravel and Silt (SP) 4.4'						
			Moist Stiff Gray/Brown LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL) 6.0'	SS 3	78	6-8-8 (16)	3.00	113	15
			Moist Very Stiff Gray/Brown LEAN CLAY w/Sand and Trace Gravel (CL)						
			@8.5': Very Stiff to Hard	SS 4	100	4-7-11 (18)	>4.5		
	10								
			13.7' ▽						
			Moist Medium Dense Gray CLAYEY SAND w/Trace Gravel (SC) 13.9'	SS 5	100	5-8-10 (18)	3.92	114	15
	15		Moist Very Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)						
			18.5'						
			Moist Medium Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL) 20.0'	SS 6	100	2-3-5 (8)	3.75		12
	20		Bottom of hole at 20.0 feet.						

TTL_GEOTECH_STANDARD 250380(TTL).GPJ GINT US LAB.GDT 10/16/25

TTL Engineering Services, LLC
1915 North 12th Street
Toledo, Ohio 43604
Telephone: 419-241-4440

BORING NUMBER B-5

CLIENT Fort Loramie Local Schools
PROJECT NAME Proposed New Athletic Building
PROJECT NUMBER 250380
PROJECT LOCATION Fort Loramie, OH
DRILLING CONTRACTOR TTL Engineering Services, LLC CW BH
RIG NO. 7822 DT
GROUND ELEVATION
DRILLING METHOD 2-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 9/18/25 **COMPLETED** 9/18/25
AT TIME OF DRILLING 19.0 ft
LOGGED BY CW **CHECKED BY** KCH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 5 Inches						
			0.4'						
			Moist Stiff to Very Stiff Brown SANDY LEAN CLAY w/Trace Gravel and Organics (CL)	SS 1	78	3-5-5 (10)	3.92	110	17
			2.0'						
			Moist Stiff Brown LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL)	SS 2	67	3-7-8 (15)	>4.5		16
	5								
			6.0'						
			Moist Very Stiff to Hard Brown LEAN CLAY w/Sand and Trace Gravel (CL)	SS 3	83	8-10-10 (20)	>4.5		
			@8': Brown/Gray, w/Trace Iron Oxide Stain Seam	SS 4	83	5-8-9 (17)	>4.5		16
	10								
			14.0'						
			Moist Stiff to Very Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 5	100	3-4-5 (9)	4.00		15
	15								
			19.0'						
			Wet Medium Dense Gray CLAYEY SAND w/Trace Gravel (SC) (Free Water Noted)	SS 6	100	4-8-8 (16)	NP		
	20		20.0'						
			Bottom of hole at 20.0 feet.						

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BORING NUMBER B-6

CLIENT Fort Loramie Local Schools
PROJECT NAME Proposed New Athletic Building
PROJECT NUMBER 250380
PROJECT LOCATION Fort Loramie, OH
DRILLING CONTRACTOR TTL Engineering Services, LLC CW BH
RIG NO. 7822 DT
GROUND ELEVATION
DRILLING METHOD 2-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 9/18/25 **COMPLETED** 9/18/25
AT TIME OF DRILLING 7.0 ft
LOGGED BY CW **CHECKED BY** KCH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings, Chips, and Patch

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		ASPHALT - 4 Inches						
			0.3' FILL - Moist Loose Brown CRUSHED STONE w/Silt and Sand	SS 1	67	7-4-2 (6)	NP		5
			3.0' FILL - Moist Very Soft Gray SANDY LEAN CLAY w/Trace Crushed Stone and Calcite Stain Seam	SS 2	6	0-0-0 (0)	1.50		19
	5								
			7.0' Moist Medium Stiff Gray/Brown LEAN CLAY w/Sand and Trace Gravel (CL)	SS 3	83	2-3-3 (6)	2.04	104	17
			8.0' Moist Very Stiff to Hard Brown/Gray LEAN CLAY w/Sand, Trace Gravel, and Iron Oxide Stain Seam (CL)	SS 4	100	6-10-11 (21)	>4.5		16
	10								
			14.2' Moist Loose Gray POORLY GRADED SAND w/Trace Gravel and Silt (SP)	SS 5	100	3-4-5 (9)	>4.5		
	15		14.3' Moist Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)						
			19.3' Moist Medium Dense Gray POORLY GRADED SAND w/Trace Gravel and Silt (SP)	SS 6	100	3-4-8 (12)	3.00		
	20		19.5' Moist Stiff to Very Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL) 20.0'						

Bottom of hole at 20.0 feet.

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BORING NUMBER B-7

CLIENT Fort Loramie Local Schools
PROJECT NAME Proposed New Athletic Building
PROJECT NUMBER 250380
PROJECT LOCATION Fort Loramie, OH
DRILLING CONTRACTOR TTL Engineering Services, LLC CW BH
RIG NO. 7822 DT
GROUND ELEVATION
DRILLING METHOD 2-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 9/19/25 **COMPLETED** 9/19/25
▽ **AT TIME OF DRILLING** 16.0 ft
LOGGED BY CW **CHECKED BY** KCH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 2 Inches 0.2'						
			Moist Medium Stiff Gray/Brown SANDY LEAN CLAY w/Trace Gravel and Organics (CL) 3.0'	SS 1	33	5-3-3 (6)	>4.5		10
	5		Moist Soft Gray/Brown LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL) 6.0'	SS 2	78	2-2-2 (4)	>4.5		20
			Moist Stiff Gray/Brown LEAN CLAY w/Sand and Trace Gravel (CL) 8.5'	SS 3	100	6-7-7 (14)	>4.5		17
	10		Moist Very Stiff to Hardy Brown/Gray LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL) 12.0'	SS 4	100	5-9-12 (21)	>4.5		
			Moist Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 5	100	4-4-6 (10)	1.30	111	14
	15		▽ 16.0' Wet Gray POORLY GRADED SAND w/Trace Gravel and Silt (SP) 18.5'						
	20		Moist Medium Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL) 20.0'	SS 6	100	3-3-4 (7)	3.50		
			Bottom of hole at 20.0 feet.						

TTL_GEOTECH_STANDARD 250380(TTL).GPJ GINT US LAB.GDT 10/16/25

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BORING NUMBER B-8

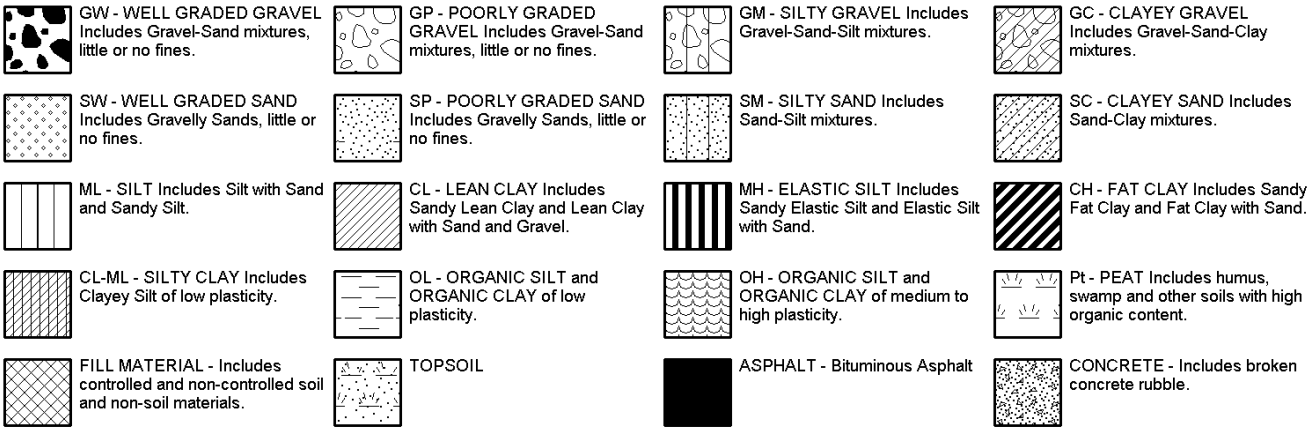
CLIENT Fort Loramie Local Schools
PROJECT NAME Proposed New Athletic Building
PROJECT NUMBER 250380
PROJECT LOCATION Fort Loramie, OH
DRILLING CONTRACTOR TTL Engineering Services, LLC CW BH
RIG NO. 7822 DT
GROUND ELEVATION
DRILLING METHOD 2-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 9/19/25 **COMPLETED** 9/19/25
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** KCH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 4 Inches						
			0.3'						
			CRUSHED STONE - 4 Inches						
			0.7'						
			Moist Medium Stiff Brown/Gray LEAN CLAY w/Trace Sand, Gravel, and Calcite Stain Seam (CL) (w/Trace Organics in SS-1 Sample, Organic Content = 3.2%)	SS 1	78	3-2-3 (5)	>4.5		23
	5		@4': Medium Stiff to Stiff, Gray/Brown	SS 2	83	3-3-5 (8)	1.35	102	19
			6.0'						
			Moist Very Stiff to Hard Gray/Brown LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL)	SS 3	100	9-8-9 (17)	>4.5		
			8.5'						
	10		Moist Stiff Gray/Brown LEAN CLAY w/Sand and Trace Gravel (CL)	SS 4	100	4-6-8 (14)	>4.5		16
			14.0'						
			Moist Soft Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 5	100	2-2-2 (4)	2.50		
	15		18.5'						
			Moist Stiff to Very Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 6	100	2-4-5 (9)	3.75		12
	20		20.0'						
			Bottom of hole at 20.0 feet.						

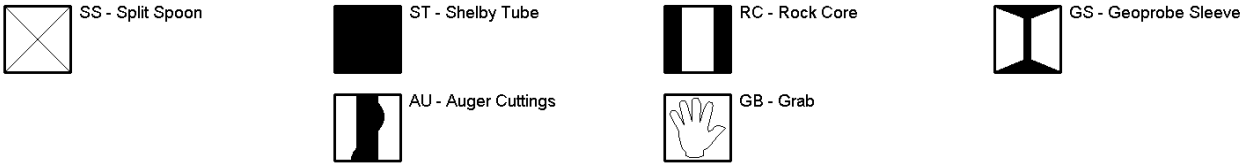
TTL_GEOTECH_STANDARD 250380(TTL).GPJ GINT US LAB.GDT 10/16/25

LEGEND KEY

Unified Soil Classification System Soil Symbols



Sample Symbols



Notes:

1. The exploratory borings were drilled on September 18 and 19, 2025, utilizing 2¼-inch inside diameter hollow-stem augers.

2. Theses logs are subject to the limitations, conclusions, and recommendations in the report and should not be interpreted separate from the report.

3. The boring locations were established in the field by TTL Engineering Services, LLC based on a plan drawing provided via email from Garmann Miller on August 18, 2025.

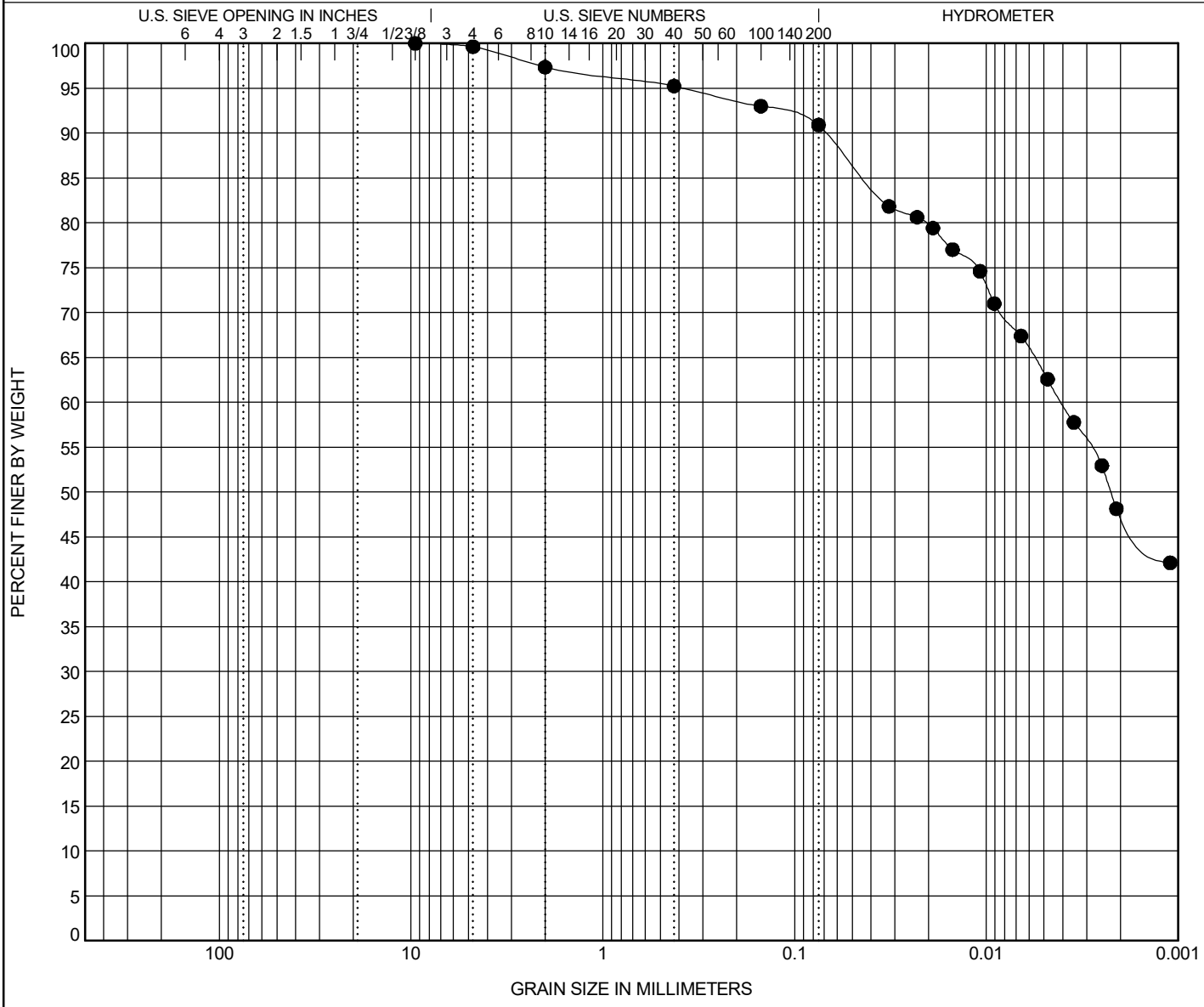
4. Unconfined Compressive Strength (tsf):
   NI = Not Intact
   NP = Non-Plastic

TTL Engineering Services, LLC
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GRAIN SIZE DISTRIBUTION

CLIENT Fort Loramie Local Schools **PROJECT NAME** Proposed New Athletic Building

PROJECT NUMBER 250380 **PROJECT LOCATION** Fort Loramie, OH



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		USCS Classification	LL	PL	PI	Cc	Cu
●	**B-8**	**1.0**	**LEAN CLAY (CL)**	**30**	**18**	**12**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-8**	**1.0**	**9.5**	**0.004**			**0.4**	**8.7**	**27.7**	**63.2**

GRAIN SIZE 250380(TTL).GPJ GINT US LAB.GDT 10/16/25

SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 PROJECT

A. Project Name: 25041.00 Fort Loramie Local Schools Athletic Complex Building & Associated Improvements

B. Owner's Name: Fort Loramie Local School District Board of Education

C. Architect's Name: Garmann/Miller & Associates Inc.

D. The Project consists of the construction of an athletic complex addition and the renovation of an existing locker room. It also includes an alternate for alternations to the existing elementary school..

E. The project is a signature project for the Owner and construction of the highest quality facility is vitally important in this respect, each contractor assumes a position of trust confidence in the performance of its duties to the Owner and shall perform its work on the project with the highest degree of competence, diligence, cooperation and workmanship.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 50 00 - Contracting Forms and Supplements.

1.03 WORK BY OWNER

A. Owner will supply the following:
   1. Golf Simulator.
   2. Taping Station
   3. Conference Table and Chairs
   4. Soap Dispenser
   5. Paper Towel Dispensers.
   6. Toilet Paper Dispensers.

1.04 OWNER OCCUPANCY

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

B. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

A. Provide access to and from site as required by law and by Owner:

B. Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.

C. Existing building spaces may not be used for storage.

D. Limit disruption of utility services to hours the building is unoccupied.

1.06 WORK SEQUENCE

A. The Owner intends to award contracts soon after the receipt of bids.

B. Coordinate construction schedule and operations with Owner.

1.07 CONTRACT NO. A - GENERAL CONSTRUCTION

A. Provide all Work except Work specifically assigned to other contractors in this Section.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 11 00

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

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

C. Change procedures.

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

1.02 RELATED REQUIREMENTS

A. Section 00 50 00 - Contracting Forms and Supplements: Forms to be used.

B. Section 00 52 13 - AIA A101 Standard Form Of Agreement: Contract Sum, retainages, payment period, monetary values of unit prices.

C. Section 00 72 13-AIA A201 General Conditions: Additional requirements for progress payments, final payment, changes in the Work.

D. 00 73 00 Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.

E. Section 01 21 00 - Allowances: Payment procedures relating to allowances.

1.03 SCHEDULE OF VALUES

A. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet.

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

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

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

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Including:
   1. Bonds
   2. Insurances
   3. Permits
   4. Allowances
   5. Mobilization
   6. Project Closeout (punch lists, attic stock, project record drawings, training. final cleaning).

F. Each line item number shall list the material and labor cost.

G. Include within each line item, a direct proportional amount of Contractor's overhead and profit.

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

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

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

B. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required.
   1. AIA G702 shall be an original and the most recent version of the form issued by the American Institute of Architects.

2. AIA G703 - Continuation Sheet: Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

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

D. Present required information on electronic media printout or in typewritten form.

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

H. Submit electronic copy of each Application for Payment.

I. Include the following with the application:
1. Transmittal letter as specified for submittals in Section 01 30 00.
2. Partial release of liens from major subcontractors and vendors.
3. Affidavits attesting to off-site stored products.

1.05 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.

B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
1. Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710 or written form.

C. 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.

D. 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 15 days.

E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
2. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.

F. Formula for Changes in the Contract Sum
1. Definitions
a. Labor - All field labor shall be priced at the current base rate, excluding fringe benefits. The payroll is based on straight time only and is to include number of hours as rate of pay for each classification of worker.

b. Fringes - All established payroll taxes, assessment of fringe benefits labor. This may include, but is not limited to. FICA, Federal and State Unemployment, Health and Welfare, Pension Funds, Worker's Compensation and Apprentice Funds.
c. Equipment Rentals - All charges for certain non-owned heavy or specialized equipment at up to 100 percent of the documented rental cost. No rental charges will be allowed for hand tools, minor equipment, simple scaffold, etc.
d. Owned Equipment - All charges for certain owned, heavy or Specialized equipment at up to 100 percent of the cost listed by the Associated Equipment Dealers Blue Book. No recovery will be allowed for hand tools, minor equipment, simple scaffold etc.
e. Trucking - A reasonable delivery charge or per mile trucking charges for delivery of require materials or equipment. Charges for use of a pickup truck will not be allowed.
f. Materials
    1) All materials purchased by the contractor and incorporated into the changed Work, showing costs, quantities, or Unit Prices of all items. Reimbursement of material cost shall only be allowed in the amount the Contractor's actual cost, including any and all discounts, rebates or related credits.
    2) One third (33 percent) of the cost of reusable materials for each use, such as formwork lumber, shoring or temporary enclosures.
g. Overhead - Includes, but not limited to, telephone, telephone charges, facsimile, telegrams, postage, photos, photocopying, hand tools, simple scaffold, tool breakage, tool repair, tool replacement, tool blades, tool bits, home office estimating and expediting, home office clerical and accounting support, home office labor, legal services, supervision, travel and parking expenses.
h. Subcontractor - The reasonable cost for all labor and material provided by a Subcontractor whose pricing is included and complies with these pricing guidelines.

2. The cost of Change Orders shall be:
    a. For each change over $ 500.00, the contractor shall furnish a detailed, written proposal itemized according to these pricing guidelines. Any subcontractor or material supplier pricing shall be itemized according to these pricing guidelines.
    b. For extra work completed by the contractor with his own forces: The sum of Labor, Fringes, Equipment Rentals, Owned Equipment, Trucking and Material plus 15 percent of the sum for overhead and profit.
    c. For extra work completed by Subcontractor of the Contractor: The Subcontractor cost plus 10 percent of the Subcontractor cost for overhead and profit.
3. Miscellaneous:
    a. The following items are allowable at the cost of the Work with no overhead and profit:
        1) The cost of extending the Bond and the cost of extending liability, property damage, builder's risk or specialty coverage insurance
        2) Fees for permits, licenses, inspection, test, etc.
    b. Cost which will not be reimbursed for Change Order Work include the following:
        1) Employee Profit Sharing Plans - regardless of how defined or described, the Contractor will pay these charges from Contractor profit.
        2) Voluntary Employee - examples are United Way and U.S. Bonds, etc.

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

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

I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

J. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

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

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 70 00.
   2. Closeout submittals in Section 01 78 00 including but not limited to:
      a. Wavier of Liens
      b. Record Drawings
      c. Operation and Maintenance Data
      d. Warranties and Bonds
      e. Certifications indicating no asbestos and lead solder in potable water systems have been incorporated into the work.
      f. Sign in sheet for Demonstrations and Instructions
      g. Signed receipt for Maintenence Materials (attic stock)
      h. Complete items of work determined by Garmann/Miller & Associates Inc.'s final inspection (completed punch list)

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 20 00

SECTION 01 21 00
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contingency allowance.

B. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

A. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CONTINGENCY ALLOWANCE

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

1. All overhead and profit contemplated for the Work performed under each Allowance is to be included in the Base Bid.

B. Funds will be drawn from the Contingency Allowance by Change Order.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 ALLOWANCES SCHEDULE

A. Contingency Allowance: General Contract - A; Include the stipulated sum/price of $300,000.00 for use upon Owner's instructions.

B. Emergency Responder Radio Allowance: General Contract - A; Include the stipulated sum/price of $[46,000.00] for use upon Owner's instructions.

C. Utilities (Gas and Electric Aid to Construction) Allowance: General Contract - A; Include the stipulated sum/price of $[60,000.00] for use upon Owner's instructions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 21 00

SECTION 01 23 00
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Sum and Contract Time.

1.02 RELATED REQUIREMENTS

A. Document 00 41 00 - Bid Form

1.03 GENERAL

A. Required alternates are worded briefly. Refer to Specification sections and Drawings for additional requirements. Claims for additional compensation will not be granted because of omissions or discrepancies due to the brevity.

B. Bidders shall indicate the addition or deduction amount from the base bid for each alternate requested in the space provided on the bid form.

C. The cost indicated on the bid form shall include material and labor as may be necessary for the identified alternate.

1.04 ACCEPTANCE OF ALTERNATES

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

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

1.05 SCHEDULE OF ALTERNATES

A. **Alternate 01: Elementary School Building Scope**
   1. Base Bid: No Scope.
   2. Alternate Bid: All Building Scope at the existing Elementary School Building as included on the drawings and specifications.

B. **Alternate 02: Masonry Veneer for Athletic Complex**
   1. Base Bid: White Split-Faced CMU Veneer as indicated on the drawings and specifications.
   2. Alternate Bid: Modular Beaver Blend Brick Veneer as indicated on the drawings and specifications.

C. **Alternate 03: Synthetic Turf**
   1. Base Bid: Provide labor, material and maintenance package for the synthetic turf as indicated on the drawings and specifications.
   2. Alternate Bid: Synthetic turf package, including labor, materials, and maintenance package, to be provided by Motz Group.

D. **Alternate 04: Graphics and Signage**
   1. Base Bid: Provide graphics and signage package as indicated on the drawings and specifications.
   2. Alternate Bid: Graphics and signage package to be provided by 49 Degrees.

E. **Alternate 05: Acoustical Treatment**
   1. Base Bid: No acoustical Treatment
   2. Alternate Bid: Provide acoustical treatment as indicated on the drawings and specifications.

F. **Alternate 06: Epoxy Flooring**
   1. Base Bid: Provide sealed concrete with integral color as indicated on the drawings and specifications.
   2. Alternate Bid A: Provide epoxy flooring in the corridors as indicated on the drawings and specifications.
   3. Alternate Bid B: Provide epoxy flooring in the restrooms, changing rooms, trainer room, and coaches office as indicated on the drawings and specifications.

G. **Alternate 07: Site Furnishings**
   1. Base Bid: Owner Provided
   2. Alternate Bid: Provide Trash Receptacle, Bike Rack and Benches as indicated on the drawings and specifications.

H. **Alternate 08: Controls**
   1. Base Bid: Controls to be stand alone computer system as indicated on the drawings and specifications.
   2. Alternate Bid: Tied into existing computer system as indicated on the drawings and specifications.

I. **Alternate 09: Metal Panel (Deduct Alternate)**
   1. Base Bid: Provide Concealed fastener Metl-Span CS-620 as indicated on the drawings and specifications.
   2. Alternate Bid: Exposed Fastner 36" wide metal panel as indicated on the drawings and specifications.

J. **Alternate 10: Roof Panel (Deduct Alternate)**
   1. Base Bid: Provide 4" Insulated Metal Panel as indicated on the drawings and specifications.
   2. Alternate Bid: Provide 4" R-Seal system with PEMB manufacturer 2" seam height standing seam metal roof, painted finish with Kynar 500 as indicated on the drawings and specifications.

K. **Alternate 11: Additional Acoustical Double-Wall Ductwork**
   1. Base Bid - Provide 1" acoustical liner in duct from ahu up to the location as noted on plans. All lined duct and fittings shall be double-walled with perforated interior.
   2. Alternate - Provide 1" acoustical liner in duct from ahu up to the location as noted on plans as alternate 11. All lined duct and fittings shall be double-walled with perforated interior. Base bid shall be non-lined, spiral seam. All exposed metal duct to be paint-grip type for painting by general contractor.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 23 00

SECTION 01 23 00
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Sum and Contract Time.

1.02 RELATED REQUIREMENTS

A. Document 00 41 00 - Bid Form

1.03 GENERAL

A. Required alternates are worded briefly. Refer to Specification sections and Drawings for additional requirements. Claims for additional compensation will not be granted because of omissions or discrepancies due to the brevity.

B. Bidders shall indicate the addition or deduction amount from the base bid for each alternate requested in the space provided on the bid form.

C. The cost indicated on the bid form shall include material and labor as may be necessary for the identified alternate.

1.04 ACCEPTANCE OF ALTERNATES

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

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

1.05 SCHEDULE OF ALTERNATES

A. **Alternate 01: Elementary School Building Scope**
   1. Base Bid: No Scope.
   2. Alternate Bid: All Building Scope at the existing Elementary School Building as included on the drawings and specifications.

B. **Alternate 02: Masonry Veneer for Athletic Complex**
   1. Base Bid: White Split-Faced CMU Veneer as indicated on the drawings and specifications.
   2. Alternate Bid: Modular Beaver Blend Brick Veneer as indicated on the drawings and specifications.

C. **Alternate 03: Synthetic Turf**
   1. Base Bid: Provide labor, material and maintenance package for the synthetic turf as indicated on the drawings and specifications.
   2. Alternate Bid: Synthetic turf package, including labor, materials, and maintenance package, to be provided by Motz Group.

D. **Alternate 04: Graphics and Signage**
   1. Base Bid: Provide graphics and signage package as indicated on the drawings and specifications.
   2. Alternate Bid: Graphics and signage package to be provided by 49 Degrees.

E. **Alternate 05: Acoustical Treatment**
   1. Base Bid: No acoustical Treatment
   2. Alternate Bid: Provide acoustical treatment as indicated on the drawings and specifications.

F. **Alternate 06: Epoxy Flooring**
   1. Base Bid: Provide sealed concrete with integral color as indicated on the drawings and specifications.
   2. Alternate Bid A: Provide epoxy flooring in the corridors as indicated on the drawings and specifications.
   3. Alternate Bid B: Provide epoxy flooring in the restrooms, changing rooms, trainer room, and coaches office as indicated on the drawings and specifications.

G. **Alternate 07: Site Furnishings**
   1. Base Bid: Owner Provided
   2. Alternate Bid: Provide Trash Receptacle, Bike Rack and Benches as indicated on the drawings and specifications.

H. **Alternate 08: Controls**
   1. Base Bid: Controls to be stand alone computer system as indicated on the drawings and specifications.
   2. Alternate Bid: Tied into existing computer system as indicated on the drawings and specifications.

I. **Alternate 09: Metal Panel (Deduct Alternate)**
   1. Base Bid: Provide Concealed fastener Metl-Span CS-620 as indicated on the drawings and specifications.
   2. Alternate Bid: Exposed Fastner 36" wide metal panel as indicated on the drawings and specifications.

J. **Alternate 10: Roof Panel**
   1. Base Bid: Provide 4" Insulated Metal Panel as indicated on the drawings and specifications.
   2. Alternate Bid: Provide 4" R-Seal system with PEMB manufacturer 2" seam height standing seam metal roof, painted finish with Kynar 500 as indicated on the drawings and specifications.

K. **Alternate 11: Additional Acoustical Double-Wall Ductwork**
   1. Base Bid - Provide 1" acoustical liner in duct from ahu up to the location as noted on plans. All lined duct and fittings shall be double-walled with perforated interior.
   2. Alternate - Provide 1" acoustical liner in duct from ahu up to the location as noted on plans as alternate 11. All lined duct and fittings shall be double-walled with perforated interior. Base bid shall be non-lined, spiral seam. All exposed metal duct to be paint-grip type for painting by general contractor.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 23 00

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Preconstruction meeting.

C. Site mobilization meeting.

D. Progress meetings.

E. Preinstallation meetings.

F. Construction progress schedule.

G. Coordination drawings.

H. Submittal schedule.

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

J. Number of copies of submittals.

K. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 33 23 - Contractor Submittal Form

B. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.

C. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

D. Section 01 91 13 - General Commissioning Requirements: Additional procedures for submittals relating to commissioning.

1. Where submittals are indicated for review by both Architect and the Commissioning Authority, submit one extra and route to Architect first, for forwarding to the Commissioning Authority.
2. Where submittals are not indicated to be reviewed by Architect, submit directly to the Commissioning Authority; otherwise, the procedures specified in this section apply to commissioning submittals.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:

1. Requests for Interpretation (RFI).
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.
7. Applications for payment and change order requests.
8. Progress schedules.
9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.

11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

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

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.
   4. All Major Subcontractors.

C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, change orders, and contract closeout procedures.
   7. Scheduling.
   8. Scheduling activities of Special Inspector required by the Authority having Jurisdiction.

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

3.02 SITE MOBILIZATION MEETING

A. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's superintendent.
   5. Major subcontractors.

B. Agenda:
   1. Use of premises by Owner and Contractor.
   2. Owner's requirements.
   3. Construction facilities and controls provided by Owner.
   4. Temporary utilities provided by Owner.
   5. Survey and building layout.
   6. Security and housekeeping procedures.
   7. Schedules.
   8. Demolition and/or construction waste management and disposal procedures.
   9. Application for payment procedures.
   10. Procedures for testing.
   11. Procedures for maintaining record documents.
   12. Requirements for start-up of equipment.
   13. Inspection and acceptance of equipment put into service during construction period.

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

3.03 PROGRESS MEETINGS

A. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

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

C. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of RFIs log and status of responses.
   7. Review of off-site fabrication and delivery schedules.
   8. Maintenance of progress schedule.
   9. Corrective measures to regain projected schedules.
   10. Planned progress during succeeding work period.
   11. Coordination of projected progress.
   12. Maintenance of quality and work standards.
   13. Effect of proposed changes on progress schedule and coordination.
   14. Scheduling activities of Special Inspector required by the Authority having Jurisdiction
   15. Other business relating to work.

D. Record minutes and distribute electronic copies within 5 days after meeting to participants, with an electronic copy to Architect, Owner, participants, and those affected by decisions made.

3.04 PRE-INSTALLATION MEETINGS (CONFERENCE)

A. A pre-installation meeting will be schedule at Project Site before construction activity that requires coordination with other construction and as indicated in the Contract Documents.

B. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting.

C. Review conditions of installation, preparation and installation procedures and coordination of related work including:
   1. Review of scope of work
   2. Review of approved submittals
   3. Manufacturers installation recommendations
   4. Deliveries
   5. Possible conflicts
   6. Compatibility problems
   7. Time schedules
   8. Environmental considerations
      a. Implementation of indoor air quality management plan procedures (LEED)
   9. Warranty requirements
   10. Acceptability of substrates
   11. Inspections and testing requirements

12. Mockup Review

D. Do not proceed with installation if the conference cannot be successfully concluded. Resolve impediments to performance of the work and reconvene the conference at the earliest feasible date

3.05 CONSTRUCTION PROGRESS SCHEDULE

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

C. Submit updated schedule with each Application for Payment.

3.06 COORDINATION DRAWINGS

A. Review drawings prior to submission to Architect.

B. As-Built Site Survey is required and all as-built notes shall be assembled in electronic form and turned into the Architect so that they are able to combine all changes into one set of documents for the Owner and the County.

3.07 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
   2. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.

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.

3.09 ELECTRONIC FILES

A. Architects' Electronic Digital Files: Electronic copies of CAD Drawings of the Contract Drawings will be provided by the Architect for Contractor's use in preparing submittals. The Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings through an electronic digital file agreement.
   1. Electronic Digital Agreement: Electronic Digital files will be distributed to Contractors upon completion of AIA Document C106 - 2022, Digital Data Licensing Agreement as modified by the Architect for this project.

END OF SECTION 01 30 00

| Submittal Stamp Area |

Contractor stamp

GARMANN MILLER

38 South Lincoln Drive
P.O. Box 71
Minster, Ohio 45865

1156 Dublin Road
Suite 102
Columbus, Ohio 43215

275 Veterans Way
Suite 200
Carmel, Indiana 46032

1690 Broadway
Suite 19-455
Ft. Wayne, Indiana 46802

createm.com

Project name : _____

Contractor name : _____

Contact name : _____

Phone : _____

Architect stamp

Subcontractor

Company : _____

Contact name : _____

Phone number : _____

Submittal # : _____

Date : _____

Description : _____

Specification section(s) : _____

Consultant stamp

- ☐ Product data
- ☐ Shop drawings
- ☐ VOC compliance form
- ☐ Maintenance data
- ☐ LEED MR form
- ☐ Samples
- ☐ Warranty
- ☐ Other : _____

SECTION 03 35 19
INTEGRALLY COLORED CONCRETE

GENERAL

1.01 SECTION INCLUDES:

A. Integrally colored concrete sidewalks and other exterior concrete pavements.

B. Curing of integrally colored concrete.

1.02 RELATED SECTIONS:

A. Section 03 3000 - Cast in Place Concrete

B. Section 32 1313 - Concrete Paving

C. Section 07 9005 - Joint Sealers

1.03 REFERENCES

A. ACI 301 Specification for Structural Concrete for Buildings.

B. ACI 302 IR Recommended Practice for Concrete Floor and Slab Construction.

C. ACI 303.1 Standard Specification for Cast-In-Place Architectural Concrete.

D. ACI 304 Recommended Practice for Measuring, Mixing, Transporting and Placing of Concrete.

E. ACI 305R Recommended Practice for Hot Weather Concreting.

F. ACI 306R Recommended Practice for Cold Weather Concreting.

G. ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete.

H. ASTM C494 Standard Specification for Chemical Admixtures for Concrete.

I. ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete.

J. AASHTO M194 Chemical Admixtures.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements

B. Product Data: Submit manufacturer's complete technical data sheets for the following:
   1. Colored admixture.
   2. Curing compound.

C. Design Mixes: For each type of integrally colored concrete.

D. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a pre-clearing meeting two weeks before starting work of this section; require attendance by all relevant contractors, subcontractors, ready mix concrete representative, manufacturer's representative and Architect.

B. Architect, General Contractor, Subcontractor, Ready-Mix Concrete Representative, and a Manufacturer's authorized representative shall be in attendance

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with 10-years experience in the production of specified products.

B. Installer Qualifications: An installer with minimum 5 years experience with work of similar scope and quality.

C. Comply with the requirements of ACI 301.

D. Obtain each specified material from same source for the entire project.

1.07 DELIVERY, STORAGE AND HANDLING

A. Colored Admixture: Comply with manufacturer's instructions. Deliver colored admixtures in original, unopened packaging. Store in dry conditions.

1.08 PROJECT CONDITIONS

A. Integrally Colored Concrete Environmental Requirements:
   1. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.
   2. Avoid placing concrete if rain, snow, or frost is forecast within 24-hours. Protect fresh concrete from moisture and freezing.
   3. Comply with professional practices described in ACI 305R and ACI 306R.

B. Schedule delivery of concrete to provide consistent mix times from batching until discharge. Mix times shall meet manufacturer's written recommendations.

PRODUCTS

2.01 MANUFACTURER

A. Manufacturer: L. M. Schofield Company

B. Acceptable Manufacturers.
   1. Davis Colors www.daviscolors.com
   2. Lambert Corporation, www.lambertusa.com
   3. Solomon Colors, www.solomoncolors.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CONCRETE MATERIALS/CONCRETE MIX DESIGN

A. See Section 03 3000 Concrete Mix Design and 32 1313 Concrete Paving for additional requirements using revisions noted below.
   1. No Fly Ash or additives allowed.
   2. 4000 P.S.I. at 28 days Max W/C ratio =0.45.
   3. Aggregate Supply: Fine aggregates. Provide aggregate from one source supply.
   4. Concrete to be colored at the batch plant (no on site coloring allowed)
   5. Do not add water to the mix in the field.
   6. Slump of concrete shall be at 4 inches or less.
   7. No chloride admixtures or synthetic or natural fibers allowed.

2.03 MATERIALS

A. Integrally Colored Concrete admixture.
   1. Product: Chormix
   2. Admixture shall be a colored, water-reducing, admixture containing no calcium chloride with coloring agents that are limeproof and ultra-violet resistant.
   3. Admixture shall conform to the requirements of ACI 303.1, ASTM C979, ASTM C494 and ASSHTO M194.

B. Curing Compound for Integrally Colored Concrete:
   1. Interior Product: Cemetone Clear Sealer.
   2. Curing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.

C. Wet Curing Blanket:
   1. McTech Group www.mctechgroup.com: Ultra Cure NCF. (Visqueen and burlap curing blankets are prohibited)

D. Curing and Sealing Compound:
   1. Curing and sealing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.

2.04 COLORS

A. Concrete Color[s]:
   1. Cement: Color shall be gray.
   2. Sand: Color shall be locally available natural sand.
   3. Aggregate: Concrete producer's standard aggregate complying with specifications.
   4. Colored Admixture: As selected by Architect.

2.05 CONCRETE MIX DESIGN

A. Do not add calcium chloride to mix.

B. Supplemental admixtures shall not be used unless approved by manufacturer.

C. Do not add water to the mix in the field.

D. Add colored admixture to concrete mix according to manufacturer's written instructions.

EXECUTION

3.01 INSTALLATION

A. Do not add water to concrete mix in the field.

B. Surfaces shall be finished uniformly with the following finish:
   1. Broomed:
      a. Pull broom across freshly troweled concrete to produce fine texture in straight lines perpendicular to main line of traffic.
      b. Do not dampen brooms.
      c. Broom in the same direction for entire concrete surface.

3.02 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. Initial Curing:
   1. Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less fourteen (14) days by wet curing blanket.

D. Final Curing: Begin after initial curing but before surface is dry.
   1. Integrally Colored Concrete: Apply curing compound for integrally colored concrete according to manufacturer's instructions using manufacturer's recommended application techniques. Apply curing compound at consistent time for each pour to maintain close color consistency.
   2. Curing compound shall be same color as the colored concrete and supplied by same manufacturer of the colored admixture.
   3. Precautions shall be taken in hot weather to prevent plastic cracking resulting from excessively rapid drying at surface as described in CIP 5 Plastic Shrinkage Cracking published by the National Ready Mixed Concrete Association.
   4. Verify compatibility of curing compound which are to receive additional finishes

E. Sealing Application

1. Concrete substrate must be completely dry. Test surface for proper pH prior to applying sealer. A pH value of 7 or higher indicates all acid has been neutralized. If the tested pH value is less than 7, repeat neutralization step until the required pH value is achieved.
2. Conduct a moisture vapor emission test prior to applying any sealer.
3. Apply sealer according the sealer manufacturer's printed instructions at a rate of 300 to 500 square feet per gallon per coat. Maintain a wet edge at all times.
4. Allow sealer to completely dry before applying additional coats.
5. Apply second coat of sealer at 90 degrees to the direction of the first coat using the same application method and rates.

3.03 TOLERANCES

A. Minor variations in appearance of integrally colored concrete, which are similar to natural variations in color and appearance of uncolored concrete, are acceptable.

END OF SECTION 03 35 19

SECTION 01 43 00
QUALITY ASSURANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Control of installation.

F. Mock-ups.

G. Manufacturers' field services.

H. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 00 31 19 - Existing Condition Information: Soil investigation data.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures.

C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2025a.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2023.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

H. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2010.

1.04 SUBMITTALS

A. See Section 01 30 00 - 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. Compliance with Contract Documents.
k. When requested by Architect, provide interpretation of results.

C. Masonry Inspection
1. Provide masonry inspection of concrete or brick masonry walls as required to insure that masonry construction is in conformance with the Contract Documents.
2. The masonry inspector shall prepare a written report or reports for each day of inspection. Masonry Inspection report.
a. Masonry Inspection report attached to this Section.
3. The masonry inspector shall be present and observe all grouting operations in wall requiring inspection. The masonry inspector shall be present at the project site with in sufficient time, in advance of grouting operations, to inspect the construction to insure its conformance to the Contract Documents and that grouting may proceed. Periodically the masonry inspector shall be present during the placement of masonry units and reinforcement.
4. No grouting shall be permitted unless the masonry inspector is present and has indicated that the masonry construction is properly prepared for grouting operation.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit report in duplicate within 30 days of observation to Architect for information.

G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications:
1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

1.06 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with

requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

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

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

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

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

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

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

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

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

C. Testing and Inspection Agency:
   1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
   2. Laboratory: Authorized to operate in State in which Project is located.
   3. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
   4. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

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

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

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

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

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

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

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

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the

following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

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

C. General:
   1. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
   2. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
   3. Accepted mock-ups shall be a comparison standard for the remaining Work.
   4. 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.

D. Masonry Exterior Wall Mock Up
   1. Construct an exterior wall mock up panel as shown on the drawings.
   2. Locate where directed. Finished face to be facing south.
   3. Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials, execution, and aesthetic effect.
   4. Build masonry mock-up of typical wall area(s) as shown on Drawings including Movement Control Joints (Sealant Filled) 1'4" (minimum length), Air Barrier, Cavity Insulation, Foamed-in-Place Insulation, Blocking for Window, Horizontal and Vertical Reinforcing, Shelf Angles and Supports, Bond Beams and Lintels, Brick Ties and Anchors Flashing, End Dams, Weeps and Vents, Cavity Drainage Material (if required), Window Head, Sill and Jamb Details.
      a. Include a sealant-filled joint at least 16 inches long in each exterior wall mock-up.
      b. Include lower corner of window opening at upper corner of exterior wall mock-up. Make opening approximately 12 inches wide by 16 inches high.
      c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mock-up approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
      d. Prior to starting general masonry cleaning, prepare mock-up for cleaning using the same cleaning materials and methods proposed for the Work.
      e. Protect accepted mock-ups from the elements with weather-resistant membrane.
      f. The construction of the mock-up shall be photographed or videotaped by the masonry contractor to be part of a presentation for groups of trades people as they join the project work force.
   5. The window contractor shall provide and install in the mock-up wall a sample window of the type and profile used. (leaving portions of the perimeter exposed for inspection of the fasteners and air barrier transition to the masonry some portions to receive final caulking inside and out)
   6. Observation and evaluation of the mock-up shall be by:
      a. The Architect
      b. Construction Manager
      c. Ohio Facilities Construction Commission Project Administrator
      d. General Trades Contractor
      e. Masonry Contractor
      f. Window Installer
      g. Testing Agency

E. Metal Wall Panel Exterior Wall Mock Up
   1. Construct an exterior wall mock up panel as shown on the drawings.

2. Locate where directed. Finished face to be facing south.
3. Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials, execution, and aesthetic effect.
4. Build metal wall panel/masonry mock-up of typical wall area(s) as shown on Drawings including, Metal Wall Panel, Metal Wall Panel Sub Framing, Air Barrier, Cavity Insulation, Foamed-in-Place Insulation, Blocking for Window, Horizontal and Vertical Reinforcing, Shelf Angles and Supports, Bond Beams and Lintels, Flashing, End Dams, Weeps and Vents, Window Head, Sill and Jamb Details.
   a. Include a sealant-filled joint at least 16 inches long in each exterior wall mock-up.
   b. Include lower corner of window opening at upper corner of exterior wall mock-up. Make opening approximately 12 inches wide by 16 inches high.
   c. Protect accepted mock-ups from the elements with weather-resistant membrane.
   d. The construction of the mock-up shall be photographed or videotaped by the metal wall panel contractor to be part of a presentation for groups of trades people as they join the project work force.
5. The window contractor shall provide and install in the mock-up wall a sample window of the type and profile used. (leaving portions of the perimeter exposed for inspection of the fasteners and air barrier transition to the masonry some portions to receive final caulking inside and out)
6. Observation and evaluation of the mock-up shall be by:
   a. The Architect
   b. Construction Manager
   c. General Trades Contractor
   d. Masonry Contractor
   e. Window Installer
   f. Testing Agency

F. Metal Roof Mock up
1. Install roof system mock up to demonstrate aesthetic effects and set quality standards for materials, execution, and workmanship.
2. Build mockup of a typical roof system as shown on the drawings a minimum of 12 panels wide including vapor barrier, insulation, underlayment, flashings, gutters, fascias, pipe flashings and associated attachments.
3. Observation and evaluation of the mock-up shall be by:
   a. The Architect
   b. Construction Manager
   c. Ohio Facilities Construction Commission Project Administrator
   d. General Trades Contractor

G. Primer, Painting, and Coatings
1. Provide mock-up illustrating coating , for each specified coating.
2. Locate where directed.
3. Mock-up may remain as part of the work.

3.03 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. 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.

C. 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.

D. 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.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.04 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

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

END OF SECTION 01 43 00

	MASONRY INSPECTION REPORT				
				Report No.:	
				Date:	
Project:				Weather:	
City, State:				Temp 7:00am:	
Project No:				Temp 3:00pm:	
Inspecting Agency:		Masonry Contractor:			
Name of Inspector:		Superintendent:			
Panel No.:					
On Grid Line:					
Between Grid Lines:					
Elev (Above Fin Flr):					
Nom CMU Size:					
CMU Laid Surface Dry					
Full Face Shell Mortar Bed Jt.					
Full Mortar Head Joint					
Cores Clear of Debris & Mortar					
Vert Reinf Bar Size					
Vert Reinf Bar Lap					
Centering Clips Used					
Grout Type (Coarse/Fine)					
Height of Grout Lift					
Grout Test Specimen No.					
Grout Vibrated					
Bond Beam Reinf Bar Size					
Bond Beam Reinf Bar Lap					
Spacers on Bond Beam Bars					
Reinf Lapped at Corners					
Bond Beams Grouted					
Masonry Anchors to Steel					
Masonry Lintel Reinf Tied					
Masonry Lintel Reinf Positioned					
Cores Grouted on Steel Lintel					
Cores Grouted Full Ht at Beams					
Remarks/Comments					
Insert y for Yes, n for No or sizes and dimensions as required. Insert N/A for not applicable					

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary telecommunications services.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Field offices.

1.02 TELECOMMUNICATIONS SERVICES

A. Job Superintendent to be on site and available via cell phone when work is performed.

1.03 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

1.04 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.05 SECURITY

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

1.06 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Coordinate allowed locations for construction parking with owner.

1.07 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 when containers are full.

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.

1.08 FIELD OFFICES

A. Coordinate location with owner.

1.09 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 01 50 00

SECTION 01 51 00
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, water, and dehumidification.

1.02 RELATED REQUIREMENTS

A. Section 01 50 00 - Temporary Facilities and Controls:
   1. Temporary telecommunications services for administrative purposes.
   2. Temporary sanitary facilities required by law.

1.03 TEMPORARY ELECTRICITY

A. Cost:
   1. Electrical Contractor to pay to connect and disconnect to the utilities service, provide temporary lighting and power distribution system for each area and/or floor of the project, and service to General Contractor field office.
   2. General Contractor to pay for cost of energy used.

B. Cost of electricity used:
   1. Redskin Training Center: By Contractor
   2. Locker Room Renovation: By Owner
   3. Elementary School Addition: By Owner

C. Connect to Owner's existing power service.
   1. Do not disrupt Owner's need for continuous service.
   2. Exercise measures to conserve energy.

D. Provide temporary electric feeder from existing building electrical service at location as directed.

E. Complement existing power service capacity and characteristics as required.

F. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

G. Permanent convenience receptacles may be utilized during construction.

H. With the exception of General Contractor field office, wiring of Contractor's offices, trailers, storage facilities and the like used during construction shall be the responsibility of the individual contractor requiring the same.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES BY ELECTRICAL CONTRACTOR

A. Permanent building lighting may be utilized during construction.

1.05 TEMPORARY HEATING

A. Prior to building enclosure:
   1. The Building shall not be considered enclosed until the permanent building shell is essentially completed with exterior openings, windows, and doors closed by permanent or temporary closures.
   2. Each contractor is to provide and pay for temporary heat required for their branch of work prior to building enclosure.

B. After building enclosure:
   1. The Building shall be considered enclosed after the permanent building shell is essentially completed with exterior openings, windows, and doors closed by permanent or temporary closures.

2. After building enclosure, the Heating Ventilating and Air Conditioning (HVAC) Contractor shall provide heating systems for temporary heat. The heating system shall permit construction to continue and progress uninterrupted. The HVAC Contractor shall maintain such systems until they are no longer required to maintain specified conditions for construction operations.
3. The HVAC Contractor shall provide temporary heat using one or both of the following methods.
    a. Method A: Use of permanent system.
        1) Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and temporary filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts. Effective date of warranties and guarantees for permanent equipment is the date of substantial completion.
        2) If permanent system is not fully operable or does not have sufficient controls to maintain the necessary heat, the HVAC Contractor shall provide temporary controls to maintain the necessary heat requirements.
        3) Equipment used shall be cleaned and restored to new condition, except for ordinary wear, prior to final acceptance.
        4) Cost of filters consumed is the responsibility of the HVAC Contractor.
    b. Method B: Use of Individual Portable Units
        1) Provide, maintain, and supervise the operation of temporary portable units, such as gas fired unit heaters, furnaces direct fired make-up air units or similar equipment. Unit shall be properly vented, piped and wired and shall be provided with a thermostat for control. Provide required safety controls.
        2) Cost filters consumed is the responsibility of the HVAC Contractor.
    c. See Section 01 5721 IAQ (indoor air quality) Construction and Preoccupancy for additional requirements.

C. After building enclosure:
    1. Cost of Energy: By General Contractor.

D. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

E. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

F. Owner's existing heat plant may be used.
    1. Exercise measures to conserve energy.
    2. Enclose building prior to activating temporary heat.

1.06 TEMPORARY VENTILATION

A. Prior to building enclosure:
    1. Each contractor is to provide and pay for temporary ventilation required for their branch of work prior to building enclosure.

B. After building enclosure:
    1. The Building shall be considered enclosed after the permanent building shell is essentially completed with exterior openings, windows, and doors closed by permanent or temporary closures.
    2. After building enclosure, the Heating Ventilating and Air Conditioning (HVAC) Contractor shall provide systems for ventilation. The ventilation system shall permit construction to continue and progress uninterrupted. The HVAC Contractor shall maintain such systems

until they are no longer required to maintain specified conditions for construction operations.

3. The HVAC Contractor shall provide temporary ventilation using one or both of the following methods.
   a. Method A: Use of permanent system.
      1) Prior to operation of permanent equipment for temporary ventilation purposes, verify that installation is approved for operation, equipment is lubricated and temporary filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts. Effective date of warranties and guarantees for permanent equipment is the date of substantial completion.
      2) If permanent system is not fully operable or does not have sufficient controls to maintain the necessary ventilation, the HVAC Contractor shall provide temporary controls to maintain the necessary ventilation requirements.
      3) Equipment used shall be cleaned and restored to new condition, except for ordinary wear, prior to final acceptance.
   b. Cost of filters consumed is the responsibility of the General Contractor.
   c. Method B: Use of Individual Portable Units
      1) Provide, maintain, and supervise the operation of temporary portable units. Provide required safety controls.
4. Cost of energy consumed and filters consumed is the responsibility of the General Contractor.

1.07 DEHUMIDIFICATION

A. Prior to building enclosure:
   1. Each contractor is to provide and pay for temporary dehumidification required for their branch of work prior to building enclosure.

B. After building enclosure:
   1. The Building shall be considered enclosed after the permanent building shell is essentially completed with exterior openings, windows, and doors closed by permanent or temporary closures.
   2. After building enclosure, the General Contractor shall provide systems for dehumidification The dehumidification system shall permit construction to continue and progress uninterrupted. The General Contractor shall maintain such systems until they are no longer required to maintain specified conditions for construction operations.
   3. Dehumidification system shall be of sufficient size to lower the humidity of the air to permit the installation and application of finish material according to manufacturer's recommendations i.e. wood flooring, casework, ceiling panels, paint etc.
   4. Dehumidification systems shall be of sufficient size to lower the moisture or water content of the substrate to allow for installation or application of finish materials according to manufacturer's recommendations i.e. wood flooring, carpet resilient flooring,epoxy terrazzo etc.
   5. Cost of energy consumed and associated work is the responsibility of the General Contractor.

C. Prior to operation of permanent equipment for temporary ventilation purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts. Effective date of warranties and guarantees for permanent equipment is the date of substantial completion.

1.08 TEMPORARY WATER SERVICE

A. Cost of water used:
   1. Redskin Training Center: By Contractor
   2. Locker Room Renovation: By Owner
   3. Elementary School Addition: By Owner

B. Connect to existing water source.
   1. Exercise measures to conserve water.

C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 51 00

SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

B. Section 31 22 00 - Grading: Temporary and permanent grade changes for erosion control.

C. Section 32 11 23 - AGGREGATE BASE AND SURFACING: Temporary and permanent roadways.

D. Section 32 92 19 - Seeding: Permanent turf for erosion control.

1.03 REFERENCE STANDARDS

A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.

B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.; 1999a (Reapproved 2014).

C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015.

D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.

E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2012.

F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017 (Reapproved 2021).

G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.

1.04 PERFORMANCE REQUIREMENTS

A. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

B. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
   1. Owner will obtain permits and pay for securities required by authority having jurisdiction.
   2. Owner will withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.

C. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
   2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

F. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
   2. Prevent development of ruts due to equipment and vehicular traffic.
   3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

G. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.
   3. Prevent mud and sediment from flowing onto sidewalks and pavements.
   4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

H. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
   2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

I. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

J. Open Water: Prevent standing water that could become stagnant.

K. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

C. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mulch: Use one of the following:
   1. Straw or hay.
   2. Wood waste, chips, or bark.
   3. Erosion control matting or netting.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Bales: Air dry, rectangular straw bales.
   1. Cross Section: 14 by 18 inches, minimum.
   2. Bindings: Wire or string, around long dimension.

D. Bale Stakes: One of the following, minimum 3 feet long:
   1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
   2. Wood, 2 by 2 inches in cross section.

E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
   1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
   2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491.
   3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
   4. Tensile Strength: 100 pounds-force, minimum, in cross-machine direction; 124 pounds-force, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
   5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
   6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533/D4533M.
   7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

F. Silt Fence Posts: One of the following, minimum 5 feet long:
   1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
   2. Softwood, 4 by 4 inches in cross section.
   3. Hardwood, 2 by 2 inches in cross section.

G. Gravel: See Section 32 11 23 for aggregate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.
   1. Width: As required; 20 feet, minimum.
   2. Length: 50 feet, minimum.
   3. Provide at each construction entrance from public right-of-way.
   4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.
   1. Provide linear sediment barriers:
      a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
      b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
      c. Along the toe of cut slopes and fill slopes.
      d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
      e. Across the entrances to culverts that receive runoff from disturbed areas.
   2. Space sediment barriers with the following maximum slope length upslope from barrier:
      a. Slope of Less Than 2 Percent: 100 feet..
      b. Slope Between 2 and 5 Percent: 75 feet.
      c. Slope Between 5 and 10 Percent: 50 feet.
      d. Slope Between 10 and 20 Percent: 25 feet.
      e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
   1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
   2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:
   1. Cover with polyethylene film, secured by placing soil on outer edges.
   2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
   1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

A. Traffic-Bearing Aggregate Surface:
   1. Excavate minimum of 6 inches.
   2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
   3. Place and compact at least 6 inches of 1 1/2 to 3 1/2 inch diameter stone.

B. Silt Fences:
   1. Store and handle fabric in accordance with ASTM D4873/D4873M.
   2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
   3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
   4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
   5. Install with top of fabric at nominal height and embedment as specified.
   6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
   7. Fasten fabric to wood posts using one of the following:
      a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gage, 0.083 inch shank diameter.
      b. Five staples per post with at least 17 gage, 0.0453 inch wire, 3/4 inch crown width and 1/2 inch long legs.
   8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
   9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Straw Bale Rows:
   1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
   2. Install bales so that bindings are not in contact with the ground.
   3. Embed bales at least 4 inches in the ground.
   4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
   5. Fill gaps between ends of bales with loose straw wedged tightly.
   6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

D. Temporary Seeding:
   1. When hydraulic seeder is used, seedbed preparation is not required.
   2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
   3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
   4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
   5. Incorporate fertilizer into soil before seeding.
   6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
   7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
   8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
   1. Promptly replace fabric that deteriorates unless need for fence has passed.
   2. Remove silt deposits that exceed one-third of the height of the fence.
   3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale Rows:
   1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
   2. Remove silt deposits that exceed one-half of the height of the bales.
   3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION 01 57 13

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 11 00 - Summary of Work: Lists of products to be removed from existing building.

B. Section 01 30 00 - Administrative Requirements

C. Section 01 43 00 - Quality Assurance: Product quality monitoring.

D. Section 01 60 00.01 - Substitution Request Form.

E. Section 22 05 13 - Common Motor Requirements for Plumbing Equipment: Motors for plumbing equipment.

1.03 REFERENCE STANDARDS

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

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

PART 2 PRODUCTS

2.01 GENERAL

A. The Specifications and Drawings are complementary, and what is required by one shall be as if required by all.

B. The Drawings govern dimensions, details and location of Work. The Drawings shall not be scaled.

C. Specifications govern quality of materials and workmanship.

D. In an event of inconsistencies within or between the Drawings and Specifications, the Contractor shall provide the better quality or greater quantity of Work and shall comply with the stricter requirements.

2.02 EXISTING PRODUCTS

A. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

B. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
   1. See Section 01 11 00 for list of items required to be salvaged for reuse and relocation.
   2. If reuse of other existing materials or equipment is desired, submit substitution request.

C. LEED Submittals: State cost of each reused product, quantity installed, and total cost of reused products.

2.03 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Made outside the United States, its territories, Canada, or Mexico.
   2. Made using or containing CFC's or HCFC's.
   3. Made of wood from newly cut old growth timber.
   4. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 61 16.
   2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.

D. Provide interchangeable components by the same manufacture for components being replaced.

E. Motors: Refer to Section 22 05 13 - Common Motor Requirements for Plumbing Equipment, NEMA MG 00001 Type. Specific motor type is specified in individual specification sections.

F. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

G. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

2.04 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.

2.05 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. Garmann/Miller & Associates Inc. will consider request for substitutions up to ten (10) calendar days prior to bid opening.

B. Proposed substitutions received by Garmann/Miller & Associates Inc., less than ten (10) days to the bid opening, may not be considered.

C. Submit request using Section 01 60 00.01 - Substitution Request Form.
   1. Submit one copy of request for substitution for consideration. Limit each request to one proposed substitution.
   2. Hard Copy Submission: Deliver submittal to Garmann/Miller & Associates Inc. business office.
   3. Electronic Submission: Forward via email to Garmann/Miller & Associates Inc.'s Project Manager, Jacob Roberts; jroberts@creategm.com and Project Coordinator; coordinator@creategm.com.

D. Substitutions will be considered after bid opening when a product, through no fault of the Contractor, becomes unavailable or unsuitable due to regulatory change.

E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

F. A request for substitution constitutes 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 or better warranty for the substitution product as there is 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.
   5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

H. Time Frame for Request. When a Substitution Request is received by the office of Garmann / Miller & Associates, Inc, during a normal business day, Architect will have a maximum of three (3) working days to respond to the Substitution Request.
   1. Weekends and holidays are not included in the three (3) day response period.
   2. Normal working day is considered between 8 AM and 5 PM.

3. Request received between 5 PM and 8 AM may be considered received on the following business day.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 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.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

K. Prevent contact with material that may cause corrosion, discoloration, or staining.

L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

M. 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 01 60 00

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Demonstration and instruction of Owner personnel.

G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

H. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

B. Section 01 43 00 - Quality Assurance: Testing and inspection procedures.

C. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

D. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

E. Section 01 91 13 - General Commissioning Requirements: Contractor's responsibilities in regard to commissioning.

F. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

G. Section 07 84 00 - Firestopping.

H. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.

3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in Ohio 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,

1.06 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
1. Minimize amount of bare soil exposed at one time.
2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

F. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 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.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.08 PROHIBITED MATERIAL AND PRACTICES

A. Contractors are advised that the following materials and practices are prohibited in this project. Each Prime Contractor will be held responsible for compliance by his personnel and the personnel of each of his subcontractors.
   1. Use of tobaco products on school property is strictly prohibited.
   2. Use of marking pens of any type on surfaces to remain exposed to view in finished building.
   3. Penetrations of roof membrane without prior coordination with Roofing Contractor.
   4. Burning of any trash or rubbish is prohibited.
   5. Use of cabinetry countertops or other equipment as a work surface, walking surface or any other purpose which could result in damage to countertops or equipment.
   6. Suspension of systems (acoustical ceilings, piping, ductwork, conduits etc) from joist bridging and deck. Each system shall be supported from the building structure (beams, joist, etc).

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - 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. Cut, move, or remove items as necessary for access to alterations and renovation work. Replace and restore at completion.

B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished work.

C. Remove debris and abandoned items from area and from concealed spaces.

D. Close openings in exterior surfaces to protect existing work and salvage items from weather and extremes of temperature and humidity. Insulate ducts and piping to prevent condensation in exposed areas.

E. Prepare surfaces and remove surface finishes to provide for proper installation of new work and finishes.

F. Clean substrate surfaces prior to applying next material or substance.

G. Seal cracks or openings of substrate prior to applying next material or substance.

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

3.03 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.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. 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.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as indicated.
2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of alterations work constitutes acceptance of existing conditions.

B. 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.

C. 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.
   c. A minimum of 3 days notice must be given the CM for any planned utility outages. See Section 02 41 00 Demolition.
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.

D. 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.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

F. 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.

G. Refinish existing surfaces as indicated:

H. 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.

I. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

D. Each trade is responsible for cutting and patching for their work unless otherwise noted.

E. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.

F. 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.

G. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

H. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

I. Restore work with new products in accordance with requirements of Contract Documents.

J. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

K. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of the penetrated element.

L. 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.

M. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

N. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

3.07 PROGRESS CLEANING BY EACH CONTRACTOR

A. Contractors shall provide daily cleanup and removal of rubbish/refuse resulting from their operations including but not limited to bulky debris, packaging, containers, unused material.

B. Remove pile of debris from the building daily. No pile of debris shall be left in the building overnight.

C. At reasonable intervals during the progress of Work, not less than once a week, perform a cleaning of dirt, dust and debris. Broom clean floor and paved surfaces and raked clean other surfaces of ground.

D. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
   1. Do not burn or bury rubbish and waste material on project site.
   2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

E. Roadway shall remain clear.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. 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.

3.09 DEMONSTRATION AND INSTRUCTION

A. See Section 01 79 00 - Demonstration and Training.

B. See Individual Specification Sections for demonstrations required.

C. The Owner reserves the right to record (electronically on audio tape, video tape or compact disc) any or all of each demonstration. The recordings are intended to be used by the Owner in maintaining the equipment or material installed.

3.10 ADJUSTING

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

3.11 FINAL CLEANING

A. Each Contractor shall perform his respective final clean up and shall leave the Work of the completed project in a clean neat condition.

B. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

C. Each Contractor shall perform shall perform his respective final clean up and shall leave the Work of the completed project in a clean neat condition including the following:
   1. Conduct an inspection of sight-exposed interior and exterior surfaces and work areas, to verify that the entire Work is left in broom clean condition.

2. Tunnels and closed off spaces shall be cleaned of packing boxes, wood frame members and other waste materials used in the construction.
3. The entire system of piping and equipment shall be cleaned internally. The Contractor installing those item shall open all direct pockets and strainers, completely blowing down as required and clean strainer screens of all accumulated debris
4. Tanks, fixtures and pumps shall be drained and proved free of sludge and accumulated matter.
5. Temporary labels, stickers etc., shall be removed from fixtures and equipment (Do not remove permanent nameplates, equipment model numbers, rating etc.)
6. Use cleaning materials that are nonhazardous.
7. 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.
8. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
9. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
10. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

D. The General Contractor will do final cleaning which will consist of the following to a degree acceptable to the Architect.
1. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels and other foreign material from sight-exposed interior and exterior surfaces.
2. Vacuum all carpeting. Clean and wax VCT floors including a minimum of three (3) coats of wax or the number of coats specified by the manufacturers which ever is greater. Wax to be approved by the Owner prior to waxing.
3. Wash and shine glazing and mirrors.
4. Polish glossy surfaces to a clear shine.
5. Dust cabinets work and remove markings
6. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
7. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
8. Clean site; sweep paved areas, rake clean landscaped surfaces.
9. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
1. Provide copies to Architect.

B. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

C. 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.

D. 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.

E. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

F. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

G. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.13 MAINTENANCE

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

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 01 70 00

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.
   5. Submit two electronic sets of final documents in final form within 10 days after final inspection. Electronic format shall be PDF's on CD's or USB flash drives.

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.

D. Certifications:
   1. Submit copies of the certifications listed in this section:
      a. Certification stating that no flux or solder used for drinking water piping .
      b. Certification stating that asbestos containing material was not incorporated into the Work.

E. Receipts:
   1. Submit copies of the receipt signed by owner for completed training sessions.
      a. See individual specifications sections for training required.
   2. Submit copies of the receipt signed by owner for maintenance material (attic stock).

a. See individual specifications sections for maintenance material (attic stock) required.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. 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. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   2. Field changes of dimension and detail.
   3. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Additional information as specified in individual product specification sections.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. 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.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 3 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Product data, shop drawings, and other submittals.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Photocopies of warranties and bonds.

4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

K. One (1) electronic copy of the Operation and Maintenance Manuals shall be placed on a CD, Thumb Drive, or other form of Mass Storage Device, for the Owners use. Files must be in a PDF format or format approved by the Owner.

3.06 WARRANTIES AND BONDS

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

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

C. Co-execute submittals when required.

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

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION 01 78 00

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Finishes, including flooring, wall finishes, ceiling finishes.
   2. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Commissioning Authority for review and inclusion in overall training plan.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees.
   3. Include Commissioning Authority's formal acceptance of training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
   1. Format: DVD Disc.
   2. Label each disc and container with session identification and date.

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 TRAINING - GENERAL

A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.

B. Conduct training on-site unless otherwise indicated.

C. Owner will provide classroom and seating at no cost to Contractor.

D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

E. Provide training in minimum two hour segments.

F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.

G. 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.

H. 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.

I. 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.

J. 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 01 79 00

SECTION 01 91 13
GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. The Owner has contracted separately with a Commissioning Authority independent from the Architect, Engineer, and Contractors. The Commissioning Authority shall be responsible solely to the Owner and shall act as an agent of the Owner in the quality control of the project. The Commissioning Authority shall, through the Owner, have the authority to direct the Contractors to perform corrective work until final acceptance of the project by the Owner.

B. The purpose of the commissioning is to verify for the Owner that building systems have been designed and installed to meet the Owner's Project Requirements and operate per the design intent. Commissioning does not eliminate or reduce the responsibility of the design team or contractors to provide a complete and functional facility but is rather to ensure an effective transition from the construction team to the Owner.

C. Specifications have been included to define contractors' responsibilities. It is expected that each contractor participates in the commissioning process, and it is the responsibility of each contractor to provide adequate personnel to do so.

1.02 RELATED DOCUMENTS

A. Section 22 08 00 - Plumbing Commissioning

B. Section 23 08 00 - HVAC Commissioning

C. Section 26 08 00 - Electrical Commissioning

1.03 RELATED REQUIREMENTS

A. LEED V4 for Building Design and Construction

B. ASHRAE Guideline 0

C. ASHRAE Guideline 1.1

D. NIBS Guideline 3-2012

1.04 SCOPE

A. The commissioning scope of services may include, but is not limited to, the following items:
   1. Perform design reviews at various stages of design.
   2. Review of submittal documents for commissioned systems.
   3. Commissioning plan.
   4. Construction checklists
   5. Periodic construction site visits
   6. Commissioning meetings as necessary.
   7. Functional testing.
   8. Develop and maintain an issues log.

9. Commissioning reports.
10. Seasonal testing, if necessary.
11. Commissioning of the following systems and equipment:
    a. HVAC Systems
    b. Plumbing Systems
    c. Electrical and Lighting Systems
    d. Building Envelope

B. The commissioning authority shall conduct and/or observe and coordinate testing as required to verify system performance.

C. The commissioning authority shall document all functional testing results.

D. The commissioning authority shall develop and maintain a record of all deficiencies found during the commissioning process. The commissioning authority shall oversee and record all corrections and resolutions.

PART 2 - COMMISSIONING PROCESS

2.01 COMMISSIONING PLAN

A. The Commissioning Plan will be developed and maintained by the commissioning authority throughout the project. At a minimum, the following items will be included in the Commissioning Plan:
1. Overview of the commissioning process
2. Systems to be commissioned
3. Commissioning team members and contact information
4. Roles and responsibilities
5. Construction checklists
6. Functional testing procedures
7. Functional testing schedule

2.02 COMMISSIONING TEAM

A. The commissioning team shall consist of key parties involved in design and construction of the facility as follows:
1. Commissioning Authority
2. School District (Owner)
3. Architect / Engineer
4. Construction Manager
5. General Contractor
6. HVAC Contractor and each of the following subcontractors:
    a. Testing and Balancing
    b. Controls
7. Plumbing contractor
8. Electrical Contractor.

2.03 COMMISSIONING MEETINGS

A. The commissioning authority (CxA) will facilitate commissioning meetings as necessary throughout the project. Commissioning team members critical to the discussion of specific meetings will be invited and expected to attend.

2.04 CONSTRUCTION PHASE

A. The Commissioning Authority may perform submittal review concurrent with the A/E's review and provide recommendations to the A/E for acceptance or rejection for major systems and equipment. All other submittals for the systems being commissioned shall be available to the Commissioning Authority for review after the submittal is approved by the A/E.

B. The Commissioning Authority will make periodic site visits throughout construction to ensure that building systems are installed per the construction documents. Site visits will be scheduled to coincide with key milestones such as equipment start-ups, pipe flushing, duct pressure testing, etc.

C. The Commissioning Authority will provide construction checklists to be completed by the installing contractors. Construction checklists will supplement, not replace, manufacturers' start-up reports. Functional testing will not commence until construction checklists are completed and returned to the Commissioning Authority.

2.05 FUNCTIONAL TESTING

A. The Commissioning Authority shall coordinate scheduling of the functional testing with the Contractors and the Owner.

B. The functional testing of the equipment listed above will include but not be limited to verifying proper operation of systems, checking the calibration of all sensors and controls, commanding damper and valve actuators fully open and closed and observing the responses, observing the operation of system safety devices, verifying that all devices go to their fail safe position upon shutdown, verifying that standby devices properly operate upon loss of primary devices, and verifying that the various control loops have been tuned and operate according to the sequence of controls and the Engineer's Design Intent.

C. The functional testing of the automatic controls system will also include but not be limited to a checkout of required graphics programming, review of the programming for compliance with the sequence of control, and analysis of trend data for proper system responses and loop stability.

2.06 CLOSEOUT

A. The Commissioning Authority may review the System Test and Balance Reports after acceptance by the design engineer for completeness, accuracy, and compliance with the contract documents and make recommendations on acceptance to the Owner.

B. The Commissioning Authority may review the O&M manuals for commissioned equipment.

C. Owner training shall be provided by the contractors in accordance with the construction documents. Training may be witnessed by the CxA.

2.07 FINAL COMMISSIONING REPORT

A. The Commissioning Authority will compile a Commissioning Record for submission to the Owner. The contractors are required to provide various documents for inclusion into the manual as described in the specifications.

B. The Commissioning Record shall include the following, at a minimum:
   1. List of principal participants and their roles.
   2. Overview of commissioning and testing scope.
   3. General description of testing and verification methods.
   4. Provide an itemized report indicating the test results for each piece of equipment commissioned, a recommendation to the Owner for the pass/fail status, and the corrective action, if any, required.
   5. A summary of all non-compliance issues.
   6. Copies of all commissioning reports including design reviews, submittal reviews, construction site visit reports, testing reports, etc.

PART 3 - EXECUTION

3.01 RESPONSIBILITIES OF THE CONTRACTORS

A. The Contractor shall provide the Commissioning Authority assistance as necessary to gain access to the construction site for the purpose of verifying that the installation of materials and equipment is performed in accordance with the contract documents. This shall include the use of keys, ladders, power lifts and other specialized equipment where necessary.

B. Assure participation of suppliers, manufacturers, and/or subcontractors in appropriate startup, training, and testing activities.

C. Participate in commissioning specific meetings scheduled by the Commissioning Authority or Construction Manager.

D. Complete pre-functional checklists for Commissioning Authority review.

E. Assist the Commissioning Authority as necessary during functional testing.

F. Provide owner training per the project specifications.

G. It is the specific responsibility of each contractor to complete all equipment setup, testing, calibration, loop tuning, and related functions prior to Commissioning. The Contractor shall complete all required checklists and certify in writing that these tasks have been accomplished and that the systems are ready for commissioning.

H. Master Issues Log
   1. Deficiencies noted during the commissioning process shall be documented in the Master Issues Log.
   2. Contractors will be responsible for correcting deficiencies and providing written responses to the Commissioning Authority describing the date and method of resolution. If the deficiency was not corrected, the contractor shall provide an explanation as to why it was not corrected.

3. Participation in the commissioning process is the contractors' responsibility. Unresolved issues or a failure to provide responses to the Master Issues Log may be considered during the pay application approval process.
4. Status will be tracked for each deficiency and the Master Issues Log will be updated accordingly.
5. The Commissioning Authority will perform limited rechecks of discrepancies after written notification has been received from the contractor that corrections are complete. The cost of subsequent rechecks, if necessary, will be charged directly to the appropriate contractor at the hourly rate of the Commissioning Authority.

END OF SECTION

SECTION 01 60 00.01 - SUBSTITUTION REQUEST FORM
(DURING BIDDING PHASE)

To: Garmann Miller Date:_____

Project: 25041.00 Fort Loramie Local Schools Athletic Complex Building & Associated Improvements

We hereby submit for your consideration the following product instead of the specified item for the above project:

Section	Section Name	Article/Paragraph	Specified Item

Proposed Substitution: _____

Manufacturer: _____ Model: _____

Submit with request all necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance.

Does the Substitution affect the dimensions shown on the drawings?

Yes _____No _____If yes, clearly indicate changes:

_____

Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution?

Yes _____No _____If no, fully explain:

What effect does substitution have on other Contracts or other trades?

_____

What effect does substitution have on the delivery and construction schedule?

_____

Differences between proposed substitution and specified item.

_____

Manufacturer's warranties of the proposed and specified items are:

Same: _____ Different: _____ Explain on an Attachment

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted by		For use by Garmann Miller	
Signature		Accepted	
Title		Not Accepted	
Firm		Accepted as Noted	
Address		Received Too Late	
email		Insufficient Data	
Telephone		By	

Fax		Date	

END OF SECTION 01 60 00.01

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building demolition excluding removal of hazardous materials and toxic substances.

B. Selective demolition of built site elements.

C. Selective demolition of building elements for alteration purposes.

D. Abandonment and removal of existing utilities and utility structures.

E. Protection of designated vegetation.

1.02 RELATED REQUIREMENTS

A. Section 01 11 00 - Summary of Work: Limitations on Contractor's use of site and premises.

B. Section 01 11 00 - Summary of Work: Sequencing and staging requirements.

C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

E. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.

F. Section 31 22 00 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

G. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Vegetation to be protected.
   2. Areas for temporary construction and field offices.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 23 23 - Fill.
   1. Recyclable Fill: Concrete and masonry products from on site demolition:
      a. Remove reinforcing and separate to salvaged metals.
      b. Remove brick and clay masonry.
      c. Crush concrete and masonry waste to less than 3 inch in each direction.
      d. Material subject to the approval by representative of the testing agency.

B. Aggregates: As specified in Section 32 11 23 Aggregate Base and Surfacing
   1. Recyclable Aggregate: Concrete and masonry products from on site demolition:

a. Remove reinforcing and separate to salvaged metals.
b. Remove brick and clay masonry.
c. Crush concrete and masonry waste to less than 1 1/2 inch in each direction.
d. Crush concrete and masonry waste with at least four (4) parts of specified aggregate for each part of concrete waste.
e. Material subject to the approval by representative of the testing agency.

2. Use of Reclaimed Base:
   a. Contractor may use a blend of new material in combination with reclaimed aggregate material.
   b. Material subject to the approval by representative of the testing agency.

PART 3 EXECUTION

3.01 SCOPE

A. Remove paving and curbs as required to accomplish new work.

B. Within area of new construction, remove foundation walls and footings in their entirety.

C. Outside area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade.

D. Remove concrete slabs on grade within site boundaries.

E. Remove manholes and manhole covers, curb inlets and catch basins.

3.02 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. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. 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.
   5. Provide, erect, and maintain temporary barriers and security devices.
   6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permit.
   9. 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.
   10. 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 fromOwner.

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. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

E. 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.

F. 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.

G. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Dismantle existing construction and separate materials.
   2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

H. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 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.

3.04 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 indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 .

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 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.

3.05 PROTECTION OF EXISTING TO REMAIN

A. Protect designated items to remain as indicated on the drawings.

B. Protect vegetation including trees and shrubbery as indicated on the drawings.

C. Perform cutting to accomplish removals neatly.

3.06 DAMAGED WORK

A. Restoration: If work to remain is damaged or destroyed due to subsequent construction/demolition operations, compensate or replace at no cost to Owner.

B. Vegetation Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction/demolition operations, compensate or replace at no cost to Owner.
1. Trees and vegetation will be considered dead when main leader has died back or when 25 percent or more of crown has died .
2. If a tree is deemed damaged or dead by the owner's representative, $500 per caliper inch of tree will be assessed.

3.07 DEBRIS AND WASTE REMOVAL

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

B. Remove from site all materials not to be reused on site; do not burn or bury.

C. Recycling, Salvage, and Reuse:
1. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
2. Recyclable Fill: Concrete and masonry products from on site demolition:
   a. As specified in Section 31 23 23 Fill
   b. Remove reinforcing and separate to salvaged metals.
   c. Remove brick and clay masonry.
   d. Crush concrete and masonry waste to less than 3 inch in each direction.
   e. Material subject to the approval by representative of the testing agency.
3. Recyclable Aggregate: Concrete and masonry products from on site demolition:
   a. As specified in Section 32 11 23 Aggregate Base and Surfacing
   b. Remove reinforcing and separate to salvaged metals.
   c. Remove brick and clay masonry.
   d. Crush concrete and masonry waste to less than 1 1/2 inch in each direction.
   e. Material subject to the approval by representative of the testing agency.
4. Use of Reclaimed Asphalt Base:
   a. As specified in Section 32 11 23 Aggregate Base and Surfacing

b. Material subject to the approval by representative of the testing agency.

5. Reclaimed Pavement:
   a. As specified in Section 32 12 16 Asphalt Paving

D. Leave site in clean condition, ready for subsequent work.

E. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 41 00

SECTION 03 15 21
UNDER SLAB VAPOR/TERMITE/GAS BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water Vapor barrier sheet.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Vapor barrier placement under concrete slab-on-grade.

B. Section 32 11 23 - Aggregate and Base Surfacing: Aggregate base preparation.

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; 2011.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.

C. Manufacturer's Installation Instructions.

D. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work and having minimum of five (5) years documented experience.

B. Pre-pour inspection: Complete by a representative of the manufactured material prior to placing of concrete. If time does not allow, representative from Architects office shall be on site to inspect prior to placing concrete.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANFACTURER

A. Basis of Design:
   1. Stego Wrap Vapor Barrier (15 mil); Stego Industries, LLC; www.stegoindustries.com.

B. Other Approved Manufacturer's
   1. Viper II Under Slab Vapor Barrier (15 mil); ISI Building Products; www.isibp.com
   2. Viaflex Vaporblock VB15 (15 mil); Viaflex Inc; www.viaflex.com
   3. Moistop Ultra Under Slab Vapor Barrier (15 mil); Henry; www.henry.com
   4. Yellow Guard Under Slab Vapor Barrier (15 mil); Husky Yellow Guard; www.yellowguard.com
   5. Substitutions: Not permitted.

2.02 MATERIALS

A. Vapor barrier sheet: ASTM E1745,Class A

B. Water vapor permeance: 0.010 perms, maximum.

C. Thickness: 15 mils.

2.03 ACCESSORIES

A. Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   1. Seams: Stego Tape
   2. Sealing Penetrations of Vapor Barrier: Stego Mastic & Stego Tape
   3. Perimeter Edge seal:
      a. Stego Crete Claw
      b. Stego Term Bar
      c. Stego Tack Tape, double sided tack tape
   4. Penetration Prevention: Beast Foot by Stego Industries, LLC.
   5. Vapor Barrier Safe Screed System; Beast Screed by Stego Industries, LLC.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen.

B. Verify final grading is complete.

C. Pre-pour inspection shall be completed by a representative of the manufactured material prior to placing of concrete. If time does not allow, representative from Architects office shall be on site to inspect and sign-off on installation prior to placing concrete.

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.

3.03 PROTECTION

A. Protect sheet materials from damage after completed installation.

B. Repair damage to installed sheet materials with manufacturer's recommended products and according to the manufacturer's written instructions.

END OF SECTION 03 15 21

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. Basic specification: Perform work of this Section according to ACI 301-16, "Specifications for Structural Concrete", except as specifically modified herein.

B. Work included: All cast-in-place concrete work shown on the Drawings and required by these Specifications. Allow for the installation of cast-in items furnished under other Sections. Install anchor bolts for structural steel. Provide and install grout under steel column base plates and beam bearing areas. Provide and install dowels for masonry walls.

C. Related work specified elsewhere: The general provisions of the Contract apply to the work of this Section, as though reproduced herein. Carefully examine all other Sections and all Drawings for related work such as concrete pads, piers, curbs, and bases required for equipment of all trades. Coordinate dimensions and details of equipment being supplied, prior to placing concrete. Cooperate with other trades who will provide and install items of work (sleeves, piping, conduit, inserts, etc.) to be cast in the concrete. Place no concrete until all such items are in place.

1.03 QUALITY ASSURANCE

A. Reference standards:
1. ACI 301, Specifications for Structural Concrete
2. ACI 318, Building Code Requirements for Structural Concrete.
3. ACI 117, Specification for Tolerances for Concrete Construction and Materials
4. ACI 347R, Guide to Formwork for Concrete.
5. ACI 302.1R, Guide to Concrete Floor and Slab Construction.
6. “Placing Reinforcing Bars", CRSI & WCRSI Recommended Practices.
7. ACI 439.5R, Comprehensive Guide for the Specification, Manufacture and Construction Use of Welded Wire Reinforcement.
8. ACI 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
9. ACI 305.1, Specification for Hot Weather Concreting.
10. ACI 306R, Guide to Cold Weather Concreting.
11. ACI Field Reference Manual, SP-15.

1.04 SUBMITTALS

A. Submit a mix design for each type of concrete mix required in accordance with ACI 301, Section 1.5.
   1. Acceptable methods of determining concrete proportions shall be in accordance with one of the following methods per ACI 301, Section 4:
      a. Establish based on previous field strength test data with standard deviation calculations.
      b. Establish based on trial mixtures with tested strength data relative to each mix design.

      In either case, provide accurate test data within allowable time periods indicated in ACI 301. Incorrect or missing data will cause for rejection of submittals.

B. Submit Placing Drawings for all reinforcing. Indicate strength, size, and details of all bar reinforcing, and style and specification of all welded wire fabric. Details must indicate clear cover used to determine chair heights.

C. Submit test data for aggregates proposed for use, indicating source and compliance with specification requirements.

D. Submit product literature for admixtures and curing compounds proposed for use.

E. Submit product literature on all proprietary materials including joint systems, hooked anchorage systems, sealers, and patching compounds.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cement: Portland Cement, ASTM C150, Type I or Type II, ASTM C1157, Type LH or GU, or ASTM C595 Type IL. All cement to be from the same mill.

B. Supplementary Cementitious Materials
   1. Fly Ash: ASTM C618, Type C or F
   2. Ground Granulated Blast-Furnace Slag, GGBF Slag: ASTM C989, Grade 100 or 120
   3. Silca Fume, Microsilica: ASTM C1240

C. Water: Potable.

D. Aggregates:
   1. Normal weight aggregates: conform to ASTM C33, (4.2.1.2).
   2. Coarse aggregate:
      a. Fill on stair pans: Gradation #8.
      b. All other classes: Gradation #57.
   3. For architecturally exposed concrete, use a single source of uniform quality throughout the work.
   4. Use crushed limestone coarse aggregate for all slabs and exterior exposed concrete.

E. Admixtures, where required or permitted per ACI 301, Section 4:
   1. Water-Reducing: ASTM C494, Type A or D.
   2. Mid-Range Water-Reducing admixture: ASTM C494, Type A.
   3. Air-entraining: ASTM C260 (4.2.1.4).
   4. High-Range Water-Reducing admixture (Superplasticizer): ASTM C494, Type F or G.
   5. Non-Chloride, Non-Corrosive accelerator: ASTM C494, Type C or E.
   6. Fly Ash: ASTM C618, Type C or F.
   7. Ground Granulated Blast-Furnace Slag, GGBF Slag: ASTM C989.
   8. Calcium Chloride and admixtures containing more than 0.06% chloride ions are NOT permitted.
   9. Use of admixtures other than those listed will be permitted only when approved prior to bid.

F. Reinforcing:
   1. Deformed bars - Uncoated: ASTM A615 or A706. Minimum yield strength to be 60 ksi.
   2. Welded Wire Fabric:
      a. Plain welded wire reinforcement: ASTM A1064. Provide in sheet form for all uses other than slabs-on-grade. Minimum yield strength is to be 65 ksi.
      b. Lap sheets a minimum distance of cross wire spacing plus two inches.
   3. Smooth joint dowel bars: ASTM A36, plain steel bars, cut true to length with square ends.
   4. Reinforcing support accessories:
      a. Provide reinforcement accessories, consisting of bar supports, spacers, hangers, chairs, ties, and similar items as required for spacing, assembling, and supporting reinforcement in place. Conform with CRSI RB4.1 and Manual of Standard Practice and the following requirements:
      b. For footings, grade beams, and slabs on grade, provide supports with precast concrete or mortar bases or plates or horizontal runners where wetted base materials will not support chair legs.
      c. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms or are in close proximity to finish surfaces, provide supports with legs which are galvanized, plastic-protected, or stainless steel.

G. Mechanical Reinforcing Splices: All mechanical splices must develop $1.25f_y$ of the reinforcing being spliced.
   1. Welded Lap Splice: Welding of all non-prestressed bars shall conform to the requirements of AWS D1.4. Provide mill test reports of reinforcing bars to demonstrate compliance.
   2. Proprietary coupling devices. Provide proprietary testing reports demonstrating compliance to strength requirements.

H. Premolded expansion joint filler: ASTM D1751.

I. Curing and Sealing Compound (VOC Compliant, 350 g/l): Liquid type membrane-forming curing compound, clear styrene acrylate type complying with ASTM C1315, Type I, Class B, 25% solids content minimum. Moisture loss shall be not more than 0.40 kg/m^2 when applied at 300 ft^2/gal. Manufacturers' certification is required. Do not apply to surfaces that are to receive subsequent cementitious toppings, sealers, hardeners, ceramic tile

resilient flooring, vinylbacked carpet, wood, terrazzo, epoxy or urethane overlays or adhesives, or other coating or finishing products. Subject to project requirements, provide one from the following manufacturers:

1. BASF Construction Chemicals.
2. Euclid Chemical Company.
3. W.R. Meadows

J. Curing Compound (Strippable): The compound shall conform to ASTM C309 and is to be used on slabs that are to receive subsequent applied finishes and where noted on the drawings. Install in strict accordance with the manufacturer's recommendations and supervision. Verify compound is compatible with the applied finish prior to placement. Subject to project requirements, provide one from the following manufacturers:

1. BASF Construction Chemicals.
2. Euclid Chemical Company.
3. W.R. Meadows

K. Grout for masonry core fill: ASTM C476, coarse type.

L. Grout under steel base plates and bearing plates: Non-shrinking, non-metallic, with minimum 28-day strength of 5,000 psi, when mixed to a fluid consistency. Subject to project requirements, provide one from the following manufacturers:

1. BASF Construction Chemicals.
2. Euclid Chemical Company.
3. Kaufman Company.

M. Vapor Retarder:

1. Conform to ASTM E1745 "Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs", Class A.
2. Vapor retarders are required under all slabs on grade which are to receive moisture-sensitive floor covering, and in humidity-controlled areas. Vapor retarders are not required under industrial slabs on grade nor under those in non-humidity-controlled areas.
3. Vapor retarder shall be installed in accordance with ASTM E1643 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs. The vapor retarder/barrier shall be a minimum of 15 mils thick and placed directly on the granular fill, below the concrete floor slab. Lap joints a minimum of 6 inches and seal with manufacturer's recommended tape or adhesive.

N. Granular fill below slabs on grade: Provide as recommended in project specific soils report. If soils report is not provided for project, use 4" deep of compacted ODOT 304 or approved equivalent AASHTO dense graded base course.

O. Structural Bonding Compound: Epoxy adhesive, 100% solids, two-component material suitable for use on dry or damp surface. Subject to project requirements, provide one from the following manufacturers:

1. Euclid Chemical Company.
2. Kaufman Company.
3. Sika Corporation.

P. Patching Compound, Epoxy Type: 100% solids, suitable for use on dry or damp surface. Subject to project requirements, provide one from the following manufacturers:
1. Euclid Chemical Company.
2. Sika Corporation.
3. W.R. Meadows

Q. Patching Compound, Cementitious Type: Subject to project requirements, provide one from the following manufacturers:
1. Euclid Chemical Company.
2. Sika Corporation.
3. W.R. Meadows

R. Curing sheets for wet curing – the following materials are approved:
1. Sisalcraft Sk-10 (C171).
2. Burlap
3. Filter Fabric (8-ounce minimum)
4. Visqueen plastic, 8 mils minimum.
5. Bur-lene curing blankets.

2.02 MIXES

A. The following mixes of concrete are required:

Mix Usage	f'_c at 28 days	Exposure Class	Maximum Water Cementitious Ratio	Air Content
Lean Concrete & Mud Slabs	1,500 PSI	F0	---	---
Footings & Interior Column Piers	3,500 PSI	F1	0.55	optional
Interior Slabs on Grade	4,000 PSI	F0	0.45	optional
Interior Slabs on Metal Deck	3,500 PSI	F0	0.45	optional
Stair Pan Fill	3,500 PSI	F0	0.45	optional
Exterior Foundation Stem Walls, Foundation Walls, & Exterior Column Piers	4,500 PSI	F2, C1	0.45	5%-7%
Exterior Slabs on Grade and Exterior Concrete Not Otherwise Identified	4,500 PSI	F2, C1	0.45	5%-7%

Concrete Mix Notes:
1) Exposure class requirements are achieved through the F'c, w/cm, and air content requirements provided to ensure adequate durability conforms to Freeze/Thaw exposures (F) or Corrosive exposures (C).
2) For all slab mixes, provide a minimum cementitious content of 520 lbs.
3) Use No. 8 coarse aggregate for metal stair pan fill.
4) Slump: Maximum 5" for all members. If a superplasticizer is used, initial slump to be 3", increased to 8" maximum after addition (at the job site) of the superplasticizer.
5) Fly ash is permitted in all mixes but shall not exceed 25% of cement weight indicated above and can be included in the water-to-cementitious ratio.

6) Ground granulated blast-furnace slag is permitted in all mixes but shall not exceed 35% of the cement weight indicated above and can be included in the water-to-cementitious ratio.
7) Silica fume (microsilica) is permitted in all mixes but shall not exceed 10% of the cement weight indicated above and can be included in the water-to-cementitious ratio.
8) Total supplemental cementitious material shall not exceed 35% of the total cement weight.
9) Mixes to be pumped are to be so identified on the mix design submittal. All pumped mixes are to have a mid-range or high-range water reducer.
10) Concrete for slabs on grade must include a mid-range or high-range plasticizer.
11) All admixtures (other than superplasticizer) are to be added at the batch plant. Superplasticizers, designed for addition to the mix at the plant, may be added at the batch plant with verification from the Engineer of Record and verification that the water-to-cement ratio has not been exceeded.
12) Maximum water-soluble chloride ion content shall not be more than the ACI limits set forth for defined corrosion classes.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Verify that excavations are free of water and ice, are of the required dimensions, and have been approved by the Soils Engineer, prior to placing concrete.

B. Determine field conditions by actual measurement.

C. Notify Architect not less than 24 hours in advance of placing concrete. Place concrete only when Construction Manager is present, unless this requirement is specifically waived.

3.02 FORMWORK AND REINFORCING

A. All formwork shall follow the guidelines of ACI 347R resulting in final formed surfaces within the tolerances of ACI 117.

B. Footings may be cast against earth cuts when soil conditions permit.

C. Removal of forms:
1. Remove no forms within 24 hours after placement.

D. Reinforcing:
1. Welding of reinforcing is prohibited, except where shown.
2. Use plastic-tipped or stainless-steel bar supports for surfaces exposed to view in finished structure.

3.03 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install all embeds shown on contract documents, including but not limited to: headed stud embeds, anchor bolts, brick ledge inserts, and dovetail anchor slots.
2. Install sleeves for mechanical, electrical, and plumbing penetrations.

B. Aluminum conduit shall not be installed in concrete.

3.04 DELIVERY AND PLACEMENT

A. Preparation before placement:
1. Remove all debris from forms and deck. Clean steel deck of grease, oil, and other substances that would reduce bond to concrete.
2. Standing water shall be removed from place of deposit before concrete is placed.
3. Do not use additives or salts to remove ice. Non-chloride deicers may be used.
4. In cold weather, comply with ACI 306R; maintain temperature of forms and reinforcing within a range of 55 - 90 degrees F.
5. In hot weather, comply with ACI 305.1.

B. Delivery is to conform to ASTM C94.
1. Delivery tickets to contain the following, in addition to the information required by C94:
2. Reading of revolution counter at first addition of water.
3. Type and brand of cement and supplementary cementitious materials.
4. Cementitious content.
5. Total water content by producer.
6. Maximum size of aggregate.
7. Secure Architect's written approval if non-agitating type equipment is to be used for transportation.
8. ASTM C94 requires discharge within 1-1/2 hours or 300 revolutions; whichever comes first, after the introduction of water to cement and aggregates, or the introduction of cement to the aggregates. Architect may require an earlier discharge during hot weather, or when high-early strength cement is being used.

C. Water addition at the site will not be permitted, except when the approved mix design has been formulated to allow for on-site addition of water. Water may only be added by personnel authorized by the Architect/Engineer and Concrete Producer.

D. Conveying: Keep delivery carts and buggies on runways; do not allow them to bear on reinforcing or uncured concrete.

E. Placement.
1. Place within 6 feet of final position. Spreading with vibrators is prohibited.
2. In walls and columns, deposit concrete in uniform horizontal layers, with a maximum depth of 4 feet (18 inches for architectural concrete).
3. Maximum free fall without chutes or elephant trunks to be 5 feet (3 feet for architectural concrete).
4. Place concrete continuously to a designed joint such that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of cold joints or planes of weakness.
5. Concrete shall be consolidated per guidelines in ACI 309.2R.

F. Records: Keep a complete log of pours, including date, location, quantity, weather, and identification of test cylinders for each pour.

3.05 JOINTING

A. Interior slabs on grade:
   1. Locate control (contraction) joints as shown on the Drawings. In the absence of information on Drawings, locate at openings, walls, columns, grid lines, and inside corners. The maximum spacing of contraction (control) joints, for reinforced and unreinforced slabs, is to be 6 times the square root of the slab thickness (i.e. for a 4-inch slab the maximum spacing is 12 feet). Cut joints ¼ times the slab thickness. The Soff-Cut Saw shall be used immediately after final finishing. A conventional saw shall be used as soon as possible without dislodging aggregate. Schedule slab pours and saw-cutting operations such that sawing is completed prior to onset of shrinkage cracking.
   2. Provide isolation joints at columns (½ inch thick) and at walls (⅛ inch thick). Where isolation joint will be exposed to view, set top of joint filler below top of slab a distance equal to the filler thickness, to receive sealant. Where not exposed to view, set top of filler flush with top of slab.

B. Exterior slabs on grade: Locate joints as shown on Drawings. In the absence of information on Drawings, provide the following (for sidewalks only):
   1. Expansion joints: Full depth, with ½ inch joint filler, where slabs abut vertical surfaces at intersections of sidewalks, at abrupt changes in width, and at a spacing not exceeding 30 feet.
   2. Control joints: Tooled, 1 inch deep, 4'-0" to 6'-0" on center between expansion joints.

C. Construction Joints in supported slabs and slabs on metal deck: Locate per Contract Document requirements, and in accordance with ACI 301 section 2.2.2.5. Submit proposed construction joint locations for review prior to proceeding with construction.

3.06 FINISHES

A. Schedule of finishes on flatwork per ACI 301, section 5 is as follows:
   1. Typical interior floor areas to receive carpet, resilient floor covering, or to remain exposed - troweled finish.
   2. Interior floor areas to receive terrazzo, quarry tile, or ceramic tile - floated finish.
   3. Exterior slabs - broom finish.

B. Surfaces of floor slabs shall be finished to the following tolerances, per ACI 117:
   1. Minimum flatness of F(f) 30, and a minimum levelness of F(l) 20, are required for typical slabs on grade. Preceding values are average values to be obtained over a given area. Minimum local values (one-half bay) of F(f) 25 and F(l) 17 shall be obtained.
   2. Minimum flatness of F(f) 25 is required for elevated slabs. Preceding value is an average value to be obtained over a given area. Minimum local value (one-half bay) of F(f) 20 shall be obtained.

C. Determination of the flatness and levelness of a concrete slab shall be made on the day following placement of the first concrete pour. Tests shall be made in accordance with ASTM E115. After it is established that proper procedures are being utilized to obtain the desired results, flatness/levelness test shall be performed only as directed by the Owner.

D. Any bay not conforming to the above flatness and levelness requirements is subject to: repair, or removal; replacement; and retesting; at no expense to the Owner.

E. "F Numbers" shall be submitted to the Owner and Architect immediately after they are determined by the testing laboratory.

3.07 CURING AND PROTECTION

A. Curing:
1. Interior slab areas that will receive non-moisture sensitive terrazzo, ceramic tile, quarry tile, or a liquid sealer/densifier, are to be moist-cured for a minimum of 7 days, without the use of a curing compound.
2. Interior slab on grade areas which will receive moisture sensitive floor coverings are to be cured with plastic sheeting, conforming to ASTM C171, for 7 days. Edges and joints are to be sealed. Rewetting of the slab at any time during construction should be avoided.
3. All other slab areas which will receive non-moisture sensitive floor coverings may be either moist-cured or receive an application of curing compound, except that when concrete above grade is placed in the open, and the air temperature exceeds 60 °F, the concrete is to be moist-cured for the first 24 hours.
4. Whichever curing method is used, it is to commence immediately after placement. Do not allow curing to be delayed overnight.
5. Prevent excessive moisture loss from formed surfaces. If forms are removed before 7 days have elapsed, cure the formed surfaces by moist-curing or application of curing compound for the remainder of the curing period.

B. Protection:
1. When air temperature during placement is less than 40 °F, or will be within 24 hours, temperature of concrete as placed is to be between 50 °F and 90 °F (55 °F and 90 °F for sections less than 12 inches thick) and a non-chloride accelerator shall be used. Maintain concrete temperature within these limits for the full curing period of 7 days.
2. When air temperature during placement is greater than 80 degrees, a water-reducing retarder shall be used. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

3.08 CLEANING AND REPAIR

A. Repair any slabs that do not meet the finish requirements. The Architect will determine whether grinding, filling of cracks, or patching and leveling procedures are required.

B. For slabs that are dusting, or showing other signs of improper curing, any corrective measures attempted will be subject to prior approval of the Architect and will be

performed at Contractor's expense. These may include additional applications of sealer/densifier, or grinding, or covering with specified repair topping.

C. Immediately prior to final acceptance, remove from all interior and exterior surfaces that are exposed to view, any stain-producing elements, such as pyrites, nail, wire, reinforcing steel, and form ties.

D. Remove all stains completely. Use of weak acids or patented cleaners is acceptable, but surface is to be completely neutralized after use.

E. All repairs shall conform to ACI 301, Section 5.3.7 except that the specified bonding compounds, cementitious, or epoxy repair materials must be used. Repair procedures must be submitted and reviewed by the Engineer of Record.

F. As-cast formed finishes shall be comply with the following:
   1. Concrete surfaces not exposed to view (Surface Tolerance Class D per ACI 117)
      a. Patch voids larger than 1-1/2" wide or ½" deep.
      b. Remove projections larger than 1".
   2. Concrete surfaces exposed to view (Surface Tolerance Class C per ACI 117)
      a. Patch voids larger than ¾" wide or ½" deep.
      b. Remove projections larger than ½".
      c. Patch tie holes.

3.09 ACCEPTANCE

A. Concrete work with serious honeycombing, form misalignment, or other deviation from Contract requirements is subject to rejection per ACI 301, Section 1.

B. When observations or tests indicate that the Contract requirements have not been met, the Contractor is to bear the costs of any additional testing and analysis to determine acceptability and also the cost of removal and replacement, if such is required per ACI 301, Section 1.

3.10 FIELD QUALITY CONTROL

A. Inspection and testing shall be in accordance with Special Inspections designated for this project as approved by the Building Official. Special Inspections must be documented with all corrective measures completed to satisfy compliance certificates as deemed necessary by the jurisdiction.

B. All tests and inspection shall be per ACI 301, Section 1.6

END OF SECTION

SECTION 03 35 11
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

B. Concrete hardener and sealer

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

B. Section 03 30 00 - Cast-in-Place Concrete: Curing compounds that also function as sealers.

1.03 ADMINISTRATIVE REQUIREMENTS

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

1.04 SUBMITTALS

A. See Section 01 30 00 - 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 not 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. Do not finish floors until interior heating system is operational.

B. Maintain ambient temperature of 50 degrees F minimum.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. Liquid Densifier/Hardener
   1. Use at following locations: As noted on the drawings.

B. Penetrating Clear Sealer:
   1. Use at following locations: As noted on the drawings.

C. High Gloss Clear Sealer
   1. Use at following locations: As noted on the drawings.

D. Liquid Densifier/Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete after set.
   1. Composition: Silicate/Siliconate.
   2. VOC content of 100g/L when calculated according to 40 CFR 59 Subpart D.

3. Products:
    a. Dayton Superior Corporation; Pentra-Hard® Guard: www.daytonsuperior.com/
    b. Euclid Chemical Company; ULTRASIL LI+: www.euclidchemical.com/
    c. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; LiON HARD: www.lmcc.com/
    d. PROSOCO, Inc; Consolideck LS: www.prosoco.com/consolideck/
    e. SpecChem, LLC; LithSeal SC: www.specchemllc.com/
    f. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COATINGS

A. High Gloss Clear Coating: Transparent, non-yellowing, water- or solvent-based coating.
    1. Anti Slip Additive: Fine anti-slip power to add texture to sealer.
        a. Product: Dayton Superior Grip Aid
    2. Products:
        a. Dayton Superior Corporation; PENTRA-HARD® GUARD: www.daytonsuperior.com/
        b. Euclid Chemical Company: ULTRAGUARD: www.euclidchemical.com/
        c. PROSOCO, Inc; LSGuard: www.prosoco.com/consolideck/
        d. SpecChem, LLC; SpecGuard: www.specchemllc.com

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.

B. Surface Preparation:
    1. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
    2. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.
    3. Remove any concrete laitance and patch or fix all cracks and damaged areas.
    4. New concrete should be properly cured a minimum of 7 days in accord with ACI 302 by one of the following methods: water, plastic sheeting, or reinforced paper.
    5. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

C. Mixing: Mix thoroughly prior to each use.

D. Placement:
    1. Apply densifier to point of rejection (by spray, roller, brush or pouring), then scrub the product using a soft bristle broom or mechanical scrubber. Work in this manner until the product begins to thicken, rewet with water and work. Do not allow the product to dry, apply additional product if needed to keep wet while working. Thoroughly rinse and then squeegee or brush off excess material until dry.
    2. On porous or rough surfaces, a second application may be required.
        a. If a second coat is required, immediately apply it in a similar manner as the first coat. Do not allow the treated surfaces to dry between applications.

E. The use of a mechanical scrubber will increase the effectiveness of the application. The treated surface will develop a "polished" appearance over time.

3.03 COATING APPLICATION

A. Surface Preparation:
   1. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
   2. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.
   3. Floors to be mechanically prepared (i.e.shotblast, sandblast) to result in a Concrete Surface Profile (CSP) of between an International Concrete Repair Institute i.e., shotblast, sandblast, to result in a Concrete Surface Profile (ICRI) CSP #1-2, or the texture of medium grit sandpaper to ensure proper adhesion.
   4. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

B. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

C. Mixing: Mix thoroughly prior to each use.

D. Placement:
   1. Apply in uniform, even applications.
   2. Surface and ambient temperature is recommended and relative humidity to be within manufacturers recommend ranges.
   3. Two coats are required
      a. First Coat: Pour the mixed material onto the floor to be coated. A squeegee can be used to uniformly spread the epoxy on the surface. Immediately back roll with a 1/4 - 3/8 inch phenolic core roller to even out the surface. Avoid over-rolling or over-working the material.
      b. Slip Resistant Surface
         1) Apply a base coat of Spec Cote WB to be applied and clean dry aggregate (silica sand) broadcast on the tacky base coat to the desired texture finish.
         2) After the base coat has cured, broom away any loose aggregate and apply a thin topcoat of Spec Cote WB to encapsulate and seal the aggregate.
      c. Second coat can be applied when the first coat is completely dry and tack free, but must be applied within 16 hours to achieve adequate adhesion and bond between coats to avoid
      d. Before second coat application check for the presence of imperfections such as epoxy blush, air bubbles etc. Correct imperfections prior to application.

END OF SECTION 03 35 11

SECTION 04 05 13
MASONRY MORTARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 05 16 - Masonry Grouting

B. Section 04 05 19 - Masonry Anchorage & Reinforcing

C. Section 04 05 23 - Masonry Accessories

D. Section 04 20 00 - Unit Masonry

E. Section 04 72 00 - Cast Stone Masonry: Installation of mortar.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

B. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

C. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

D. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

E. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar; 2017.

F. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

G. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

H. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2012.

I. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength; 2013.

J. ASTM C1142 - Standard Specification for Extended Life Mortar for Unit Masonry; 1995 (Reapproved 2013).

K. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar; 1992a (Reapproved 2014).

L. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2014.

M. ASTM C1357 - Standard Test Methods for Evaluating Masonry Bond Strength; 2009.

N. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

D. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.06 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 43 00 - Quality Assurance.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.
   1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Hot Weather Requirements: Comply with IMIAWC (HW) .

PART 2 PRODUCTS

2.01 MORTAR APPLICATIONS

A. At Contractor's option, mortar may be field-mixed from packaged dry materials or made from factory premixed dry materials with addition of water only.

B. Mortar Color: Natural gray unless otherwise indicated.

C. Mortar Mix Designs: ASTM C270, Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
      a. Color: Natural gray color for non colored block
   2. Exterior Cavity Walls: Type S mortar with Type N pointing mortar.
      a. Color: Natural Gray
   3. Exterior, Loadbearing Masonry: Type S.
      a. Color: Natural Gray
   4. Exterior, Non-loadbearing Masonry: Type N.
      a. Color: Natural Gray
   5. Interior, Loadbearing Masonry: Type S.
      a. Color: Natural Gray
   6. Interior, Non-loadbearing Masonry: Type N.
      a. Color: Natural Gray

2.02 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C387/C387M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Types as scheduled in this section.
   2. Color:
      a. Natural Gray

B. Portland Cement: ASTM C150/C150M.

1. Type: Type I - Normal; ASTM C150/C150M.
2. Color: Standard gray.

C. Water: Clean and potable.

D. Cold Weather Admixture: Non chloride, noncorrosive, accelerating admixture complying withASTM C494/C494M Type C.
1. Acceptable Manufacturers:
   a. Euclid Chemical; ACCELGUARD 80: www.euclidchemical.com.
   b. Sika; SikaSet NC: www.usa.sika.com.
   c. Master Builders Solutions; MasterSet FP 20: www.master-builders-solutions.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

E. Bonding Agent: Latex type.

F. Integral Water Repellent Admixture: Polymeric liquid or powder admixture added to mortar at the time of manufacture.
1. Application: All exterior units exposed to the exterior.
2. Performance of Mortar with Integral Water Repellent:
   a. Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
   b. Compressive Strength: ASTM C1314; maximum 5 percent decrease.
   c. Drying Shrinkage: ASTM C1148; maximum 5 percent increase in shrinkage.
3. Use water repellent admixtures for masonry units and mortar by a single manufacturer.
4. Manufacturers:
   a. GCP Applied Technologies; DRY-BLOCK Mortar Admixture: www.gcpat.com.
   b. Master Builders Solutions; MasterPel 240MA: www.master-builders-solutions.com.
   c. Moxie International; Moxie Shield 1800 Admixture: www.moxieshield.com.
   d. Krete Industries, Inc.; Krete Gard Mortar Mix: www.krete.com.
   e. Sika; SikaMix AE-6 M: www.usa.sika.com.
   f. SPEC MIX; IWR Integral Water Repellent Mortar: www.specmix.com.
   g. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within two hours of mixing.

F. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

G. Do not use calcium chloride in mortar.

2.04 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 43 00 - Quality Assurance.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.
1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

3.02 INSTALLATION

A. Install mortar to requirements of section(s) in which masonry is specified.

B. Remove excess mortar from grout spaces.

3.03 FIELD QUALITY CONTROL

A. An independent testing agency will perform field tests, in accordance with provisions of Section 01 43 00 - Quality Assurance.

B. The owner will employ services of an independent testing agency to perform specified testing and inspections

C. All mortar shall meet the "proportion specification" of ASTM C-270 and be made with portland cement/lime (non air-entrained). The use of masonry cement mortar is strictly prohibited. Use Type 'S' for walls below grade and Type 'N' for all other walls.

END OF SECTION 04 05 13

SECTION 04 05 16
MASONRY GROUTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grout for masonry

1.02 RELATED REQUIREMENTS

A. Section 04 05 13 - Masonry Mortaring

B. Section 04 05 19 - Masonry Anchorage & Reinforcing

C. Section 04 05 23 - Masonry Accessories

D. Section 04 20 00 - Unit Masonry

E. Section 08 11 13 - Hollow Metal Doors and Frames: Products and execution for grouting steel door frames installed in masonry.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

B. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.

C. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

D. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2010.

E. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

F. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

G. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

H. ASTM C1019 - Standard Test Method for Sampling and Testing Grout; 2013.

I. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2014.

J. ASTM E518/E518M - Standard Test Methods for Flexural Bond Strength of Masonry; 2010.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C476 is to be used.

C. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.06 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 43 00 - Quality Assurance.

B. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.
   1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Hot Weather Requirements: Comply with IMIAWC (HW).

PART 2 PRODUCTS

2.01 GROUT APPLICATIONS

A. At Contractor's option, grout may be field-mixed from packaged dry materials or made from factory premixed dry materials with addition of water only.

B. Grout Mix Designs:
   1. Bond Beams and Lintels: 2,500 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
      a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
      b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
   2. Engineered Masonry: 2,500 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
      a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
      b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.02 MATERIALS

A. Portland Cement: ASTM C150/C150M.
   1. Type: Type I - Normal; ASTM C150/C150M.
   2. Color: Standard gray.

B. Grout Materials:
   1. Portland Cement: ASTM C150, Type I
   2. Grout Aggregate: ASTM C404.
      a. Fine Aggregates: Clean, sharp, natural sand free from loam, clay lumps, or other deleterious substances.
      b. Coarse Aggregates: Clean, uncoated, pea gravel containing no clay, mud, loam, or foreign matter. Maximum aggregate size 3/4 inch.
   3. Flyash: ASTM C618-89a, Type C or F may be substituted for up to 20 percent of the total cementitious materials in the grout mix.

C. Grout Coarse Aggregate: Maximum 3/8 inch size

D. Water: Clean and potable.

E. Cold Weather Admixture: Non chloride, noncorrosive, accelerating admixture complying with ASTM C494, Type C.
   1. Acceptable Manufacturers:
      a. Substitutions: See Section 01 60 00 - Product Requirements.

F. Bonding Agent: Latex type.

2.03 GROUT MIXING

A. Grout Mixes shall be plant mix or factory blended (dry mix with water added at the site)

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

1. Grout Proportions (by volume): Comply with Table 1, ASTM C476.
    a. Fine Grout: 1 part portland cement, 0 to 1/10 part hydrated lime or lime putty, 2-1/4 to 3 parts fine aggregate.
    b. Coarse Grout: 1 part portland cement, 0 to 1/10 part hydrated lime or lime putty, 2-1/4 parts fine aggregate, 1 to 2 parts coarse aggregate.
2. Grout Slump: Properly proportioned grout shall have a slump of 8 to 10 inches.

C. Do not use anti-freeze compounds to lower the freezing point of grout.

D. Do not use calcium chloride in grout.

2.04 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 43 00 - Quality Assurance.

B. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.
1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

3.02 INSTALLATION

A. Install grout to requirements of section(s) in which masonry is specified.

B. Do not install grout in lifts greater than 16 inches without mechanically consolidating.

C. Do not displace reinforcement while placing grout.

D. Remove excess mortar from grout spaces.

3.03 GROUTING

A. Use low-lift grouting techniques subject to other limitations of Contract Documents.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field tests, in accordance with provisions of Section 01 43 00 - Quality Assurance.

B. The owner will employ services of an independent testing agency to perform specified testing and inspections

C. Test and evaluate grout using the Unit Strength Method (ASTM C1019) or the masonry assembly using the Prism Test Method (ASTM C1314).
1. Unit Strength Method: Test and evaluate grout in accordance with ASTM C1019 procedures.
    a. Sampling and testing for field quality control will be performed by the Contractor's testing laboratory during the placement of each type of grout fill, as follows:
        1) Sampling Fresh Grout Fill: ASTM C1019.
        2) Slump: ASTM C143/C143M; one test for each grout load at point of discharge; and one for each set of compressive strength specimens.
        3) Air Content: ASTM C231; one for every other grout load at point of discharge, or when required by an indication of change.
        4) Compressive Strength Tests: ASTM C1019; one set of compression cubes for each 50 cubic yards or fraction thereof, of each mix design placed in any one day or for each 2,500 square feet of surface area placed, whichever provides more cubes.

(a) Specimens:
(1) One (1) specimen tested at 7 days.
(2) Two (2) specimens tested at 28 days
(3) One (1) specimen tested at the direction of the Architect.
(4) ASTM C 109; the testing laboratory will take a minimum of one set of 4 standard cubes for each compressive strength test, unless otherwise directed by the Architect.
(b) Adjust mix if test results are unsatisfactory and resubmit for review.
(c) Grout which does not meet the strength requirements is subject to rejection and removal from the Work at the expense of the Contractor.
(d) The Contractor shall provide all samples and conduct testing as required at no cost to the Owner. See Section 01 43 00 for additional information.

5) Grout Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens is made. Comply with the requirements of Section 03 30 00-Cast-In-Place Concrete for Cold and Hot Weather Placement.

6) Evaluation of Quality Control Tests:
(a) Do not use grout delivered to the final point of placement which has slump, temperature, or total air content outside the specified values.
(b) If the compressive strength tests fail to meet the minimum requirements specified, the grout represented by such tests will be considered deficient in strength and subject to removal, replacement, reconstruction, or to other action required by the Architect, all at the Contractor's expense.

b. Prism Test Method: Test masonry for compressive strength in accordance with ASTM C1314, perform tests and evaluate results as specified in individual masonry sections.

END OF SECTION 04 05 16

SECTION 04 05 19
MASONRY ANCHORAGE & REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Masonry Reinforcement and Anchorage.

1.02 RELATED REQUIREMENTS

A. Section 04 05 13 - Masonry Mortaring

B. Section 04 05 16 - Masonry Grouting

C. Section 04 05 23 - Masonry Accessories

D. Section 04 20 00 - Unit Masonry

E. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

F. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.

G. Section 07 21 13 - Board Insulation: Insulation for cavity spaces.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2018.

C. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2011.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.

F. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting two weeks before starting work of this section; require attendance by all relevant installers, architect and structural engineer.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for specified items.

C. Shop Drawings: Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

1. Provide elevations of shear wall reinforcing.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT MATERIALS

A. Masonry Mortaring as specified in Section 04 05 13.

B. Masonry Grouting as specified in Section 04 05 16.

2.02 REINFORCEMENT AND ANCHORAGE

A. General:
   1. Joint Reinforcement, General ASTM A951/A951M
   2. Fabricate from cold-drawn steel wire complying with ASTM A82, with deformed or embossed continuous side rods and plain cross-rods, with unit width of 1 1/2 to 2 inches less than thickness of wall or partition.

B. Reinforcing Steel: ASTM A615/A615M Grade 60 (420) deformed billet steel bars; uncoated.
   1. Size and spacing as indicated on the drawings.
   2. Use #3 space bars at 48 inch spacing connected to longitudinal reinforcing bars in concrete masonry bond beams to hold bars in proper location.
   3. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.
   4. Shop fabricate bars requiring hooks or bends

C. Caging Devices and Centering Clips: Nine (9) gauge hot dip galvanized steel wire caging device.
   1. Use in hollow concrete masonry cores or cavities to be reinforced with vertical reinforcing steel bars and filled with grout using high-lift grouting.
   2. Manufacturers:
      a. Hohmann & Barnard, Inc: RB Rebar Positioner: www.h-b.com.
      b. Wirebond: Figure 8 Rebar Positioners: www.wirebond.com.
      c. Heckman Building Products Inc.: Product #376: www.heckmannbuildingprods.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

E. Single Wythe Joint Reinforcement: Ladder type; ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B; 0.1483 inch (9 gauge) side rods 0.1483 inch (9 gauge) 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.
   1. Manufacturers:
      a. Hohmann & Barnard, Inc (Dur-O-Wall); Product 220 Ladder Mesh Series: www.h-b.com.
      b. Masonry Reinforcing Corporation of America (Wire Bond); Product 200 Series: www.wirebond.com.
      c. Heckman Building Products Inc.: Product 1100 Series: www.heckmannbuildingprods.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

F. Multiple Wythe Joint Reinforcement: Ladder type; ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/153M, Class B; 0.1483 inch (9 gauge) side rods with 0.1483 inch (9 gauge) 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.
   1. Application: Concrete masonry anchored to concrete masonry where both wythes course out.
   2. Manufacturers:
      a. Hohmann & Barnard, Inc (Dur-O-Wall); Product 240 Twin Mesh Series: www.h-b.com.
      b. Masonry Reinforcing Corporation of America (Wire Bond); Product Ladder 4 wire: www.wirebond.com.

c. Heckman Building Products Inc.: Product 1300 Series: www.heckmannbuildingprods.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

G. Adjustable Multiple Wythe Joint Reinforcement: Ladder type with adjustable ties or tabs spaced at 16 in on center ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/153M, Class B; 0.1875 inch (3/16 inch) side rods with 0.1483 inch (9 gauge) cross rods and adjustable components of 0.1875 inch wire; width of components as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from each masonry face.
1. Application: Clay masonry anchored to concrete masonry, or where wythes do not course out.
2. Eyes to be 3/16 inch
3. Plinth (Legs) to be double leg 3/16 inch diameter with compressed legs and designed to secure insulation against outer face of inner wythe of masonry.
4. Vertical adjustment: Not less than 2 inches.
5. Manufacturers:
a. Hohmann & Barnard; 270-2X Ladder Eye-Wire: www.h-b.com.
b. Wire-Bond; Series 800 Ladder Level-Eye (Hook & Eye): www.wirebond.com.
c. Heckman Building Products;#1300 Ladder Pintle Eye Wire Reinforcement: www.heckmanbuildingprods.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

H. Adjustable Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
2. Manufacturers:
a. Hohmann & Barnard, Inc (Duro-O-Wall).; Product 359 weld on tie -301W anchor: www.h-b.com.
b. Masonry Reinforcing Corporation of America (Wire Bond); Product Type I Weld on Anchor 1200 Beam Tie: www.wirebond.com.
c. Heckmann Building Products, Inc.; Product 315 weld on anchor rod - 318 web tie: www.heckmannbuildingprods.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

I. Intersecting Masonry Wall Joint Reinforcing (Wire Mesh Reinforcing).
1. Wire mesh wall ties for of 1/2 inch mesh by 16 gauge hot dip mill-galvanized wire, 1 inch less than the width of wall.
2. Manufacturers:
a. Hohmann & Barnard, Inc (Duro-O-Wall).; Product MWT - Mesh Wall Tie: www.h-b.com.
b. Masonry Reinforcing Corporation of America (Wire Bond); Product Mesh Wall TIe #1900: www.wirebond.com.
c. Heckmann Building Products, Inc.; Product #269 Wire Mexh Wall Tie: www.heckmannbuildingprods.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

J. 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 2 inches.
4. Adhesive backed tape 3 inch wide
5. On-course Masonry Backup
    a. Manufacturers:
        1) Hohmann & Barnard, Inc (Dur-O-Wall); 270 Ladder Eye-Wire with 2X-Hook.
        2) Masonry Reinforcing Corporation of America (Wire Bond); Ladder Hook and Tie: www.wirebond.com.
        3) Heckmann Building Products, Inc;Ladder Pintle Eye Wall Reinforcement (1300).
        4) Substitutions: See Section 01 60 00 - Product Requirements.
6. Off-course Masonry Backup, Concrete Backup, or Metal Stud Backup
    a. Manufacturers:
        1) Hohmann & Barnard, Inc (Dur-O-Wall); 2-Seal Tie.
        2) Masonry Reinforcing Corporation of America (Wire Bond); Sure Tie Anchoring System: www.wirebond.com.
        3) Heckmann Building Products, Inc; The Original Pos-I-Tie Brick Veneer Anchoring System (75).
        4) Trufast; Thermal-Grip Masonry Veneer Anchor; www.trufastwalls.com.
        5) Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive anchorages and reinforcing.

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. Clean reinforcement of loose rust

C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 INSTALLATION GENERAL

A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement type joints, returns, and offsets.

B. Thickness: Build masonry walls to the full thickness shown except single width walls to be nominal unit thickness.

C. Cut masonry units with motor driven saw designed to cut masonry with clean sharp unchipped edges.

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

A. Horizontal Joint Reinforcing
    1. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
    2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
    3. Place continuous joint reinforcement in first and second joint below top of walls.
    4. Lap joint reinforcement ends minimum 6 inches.

5. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
6. Provide continuity at corners and walls intersections by use of prefabricated 'L' and 'T' sections.
7. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 16 inches vertically.

B. Vertical Joint Reinforcing
1. Reinforcement Bars: Secure at locations indicated and to avoid displacement during grouting. Minimum spacing between bars or to masonry surfaces shall be one bar diameter.
a. Secure vertical bar locations by use of caging devices and centering clips.
b. Welding of splices is not permitted.
2. Reinforced Hollow Unit Masonry: Keep vertical cores to be grouted clear of mortar, including bed area of first course.

C. Bond Beams: At bond beams or other locations for horizontally reinforced masonry, provide special masonry units or saw to accommodate reinforcement.

3.05 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in firstand second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in firstand second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforcestack bonded unit joint corners and intersections with strap anchors 16 inches on center.

3.06 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in firstand second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in firstand second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

3.07 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in firstand second horizontal joints above and below openings. Extend minimum 16 inches each side of openings.

C. Place continuous joint reinforcement in firstand second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 24 inches horizontally and 24 inches vertically.

F. Reinforcestack bonded unit joint corners and intersections with strap anchors 16 inches on center.

3.08 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in firstand second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in firstand second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 24 inches horizontally and 24 inches vertically.

G. Reinforcestack bonded unit joint corners and intersections with strap anchors 16 inches on center.

3.09 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Fill cores in hollow concrete masonry units with grout 3 course (24 inches) under bearing plates beams posts and similar items, unless otherwise indicated.

E. Do not build into masonry construction organic materials that are subject to deterioration.

END OF SECTION 04 05 19

SECTION 04 05 23
MASONRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Masonry Accessories

B. Flashings

1.02 RELATED REQUIREMENTS

A. Section 04 05 13 - Masonry Mortaring

B. Section 04 05 16 - Masonry Grouting

C. Section 04 05 19 - Masonry Anchorage & Reinforcing

D. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2015b.

C. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting two weeks before starting work of this section; require attendance by all relevant installers, architect and structural engineer.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for specified items.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

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

B. Handle and store ceramic glazed masonry units and pre-faced concrete block units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT MATERIALS

A. Masonry Mortaring as specified in Section 04 05 13

B. Masonry Grouting as specified in Section 04 05 16

2.02 FLASHINGS

A. Stainless Steel Flashing - Self-Adhering: ASTM A240/A240M; 2 mil type 304 stainless steel sheet with butyl adhesive and a removable release liner.

1. Manufacturers:
    a. York Flashings; York 304 SA: www.yorkflashings.com.
    b. Wire-Bond; Bond-N-Flash SA: www.wirebond.com.
    c. Homann & Barnard; Mighty-Flash-SA: www.h-b.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Transition Flashing
1. Multipurpose, modified butyl, self-adhered flashing
2. Thickness: 45 mils
3. Basis of Design: DuPont DuraGard CM Transition Flashing
4. Applications:
    a. Through-wall flashing
    b. Rough window openings
5. Complies with ASTM E331, ASTM E2357, ASTM E283, ASTM E154, AAMA 711-20, ASTM D1970, ASTM E96

C. Single-Wythe Flashing: High-density polypropylene composition molded into a 5/8 inch thick flashing pan with 5/16 inch perimeter flanges with integral weep spout and insect guard, no visible drip edge.
1. Manufacturers:
    a. Mortar Net Solutions: Blockflash
    b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Flashing Termination Bar: Stainless Steel 1/8 inch thick x 1 inch wide with holes at 16 inches on center. Hole size is 5/16 inch (8mm) diameter
1. Manufacturers:
    a. Advanced Building Products Inc: Stainless Steel Termination Bar
    b. Hohmann and Barnard Inc.: T1
    c. Heckmann Building Products: Termination Bar
    d. Masonry Reinforcing Corporation of America, Wire Bond: Termination Bar
    e. Substitutions: See Section 01 60 00 - Product Requirements

E. Flashing End Dams and Corners:
1. Stainless Steel Flashing: ASTM A 666, Type 304, soft temper; 26 gauge thick; finish 2B to 2D.
2. Solder joints to ensure seal.

F. Sheet Metal Cavity Bridge:
1. Stainless Steel Flashing: ASTM A 666, Type 304, soft temper; 26 gauge thick; finish 2B to 2D.
2. Application: To support thru wall flashing at air spaces and cavity wall insulation.

G. Sheet Metal Drip Edge:
1. Stainless Steel Flashing: ASTM A666/A666M, Type 304, soft temper; 26 gage, 0.0187 inch thick; finish 2B to 2D.
2. Depth: Equal the masonry unit.
3. Application: Where drip edge is required per recommendations of NCMA-Tek 19-4

2.03 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints to be used with standard sash block.
1. Manufacturers:
    a. Hohmann & Barnard, Inc; RS Series: www.h-b.com

b. Masonry Reinforcing Corporation of America, Wire Bond; Product 2901 Control Joint www.wirebond.com.
c. BoMetals Inc. Rubber Control Joint www.bometals.com
d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Joint Filler: Closed cell neoprene sponge; oversized 50 percent to joint width; self expanding; 3/8 inch thick x width of brick x by maximum lengths available.
1. Manufacturers:
a. Hohmann & Barnard, Inc; NS Close Cell Neoprene Sponge: www.h-b.com.
b. Masonry Reinforcing Corporation of America, Wire Bond; Product Vertical Expansion Joint: www.wirebond.com.
c. BoMetals Inc. Closed Dell Neoprene Sponge Rubber Joint Filler, www.bometals.com
d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Cavity Mortar Control (Cavity Mortar Diverter): 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.
2. Thickness: The same thickness of the air space in the cavity. Material should touch both sides of air space (insulation and masonry)
3. Height: The minimum height is 10 inches.
4. Manufacturers:
a. Mortar Net USA Limited: Product, Mortar Net
b. Hohman & Barnard, Inc.; Product Mortar Trap
c. Advanced Building Products Inc; Mortar Break: www.advancedflashing.com/

D. Nailing Strips: Softwood lumber, preservative treated; as specified in Section 06 10 00.

E. Cavity Vents (Weeps): Molded PVC grilles, insect resistant.
1. Size: 3/8 inch by 3 5/8 inch by height of masonry unit
2. Color(: As selected by Architect from manufacturer's full range.
3. Manufacturers:
a. Advanced Building Products, Inc: Mortar Maze Weep Vents: www.advancedbuildingproducts.com.
b. Hohmann & Barnard, Inc; QV - Quadro-Vent: www.h-b.com.
c. Mortar Net Solutions; CellVent: www.mortarnet.com/#sle.
d. WIRE-BOND: www.wirebond.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

F. Column Isolation: 3/8 inch thick foam expansion joint filler
1. Manufacturer:
a. W R Meadows Inc.: Product, Ceramar Flexible-Foam
b. Williams Products Inc.
c. Illinois Products Corporation
d. Substitutions: See Section 01 60 00 - Product Requirements.

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. Clean reinforcement of loose rust

C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 WEEPS/CAVITY VENTS

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

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.

3.04 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. 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.

3.05 SINGLE WYTHE FLASHING

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. General: Installed embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

C. Install in accordance to manufacturers' recommendations.

D. Install with weep spouts flush with the face of the foundation or concrete masonry unit course. Use the reference lip on the bottom of the weep spout to properly position the pan on the foundation or concrete masonry units.

E. Install with standard mortar spreading techniques with mortar lapped.

F. Install mesh strips in concrete masonry unit core cavity immediately above each flashing location with the mesh aligned against the outside and inside faces of the block and with each mesh strip touching the flashing pan below it to prevent clogging from mortar and grout droppings.

G. Remove obstructions from weep spouts, but do not remove the factory-installed insect guards.

3.06 MASONRY FLASHINGS

A. General: Installed embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

1. Install concealed through-wall flashing in accordance with SMACNA Architectural Sheet Metal Manual" Chapter 4 Flashing and with NCMA TEK Bulletins 19-4 and 19-5 details to ensure water resistant masonry construction.

B. Installed preformed corners and end dams, under flexible flashing membrane, bedded in sealant (as approved by manufacturer of preformed corner, end dams, and flexible flashing for compatibility) in appropriate locations along wall.

C. Install sheet metal cavity angle across the cavity and anchor to the masonry backup

D. Remove or cover protrusions or sharp edges that could puncture flashings.

E. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

F. Install flashing over metal flashing. Roll flashing into place. Ensure continuous and direct with substrate. Avoid trapping air and forming wrinkles.

G. Extend flashing to the face of the exterior wall.

H. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

I. Terminate flashing on vertical wall with termination bar and seal top of bar to the vertical wall.

J. Seal lapped ends and penetrations of flashing before covering with mortar.

3.07 CONTROL AND EXPANSION JOINTS

A. Install control and expansion joints
   1. Where shown on the drawings
   2. In accordance with the Brick Industry Association (BIA) recommendations.
   3. In accordance with the National Concrete Masonry Association (NCMA) recommendations.

B. Do not continue horizontal joint reinforcement through control or expansion joints.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

D. Size control joints as indicated on drawings; if not shown, 3/8 inch wide and deep.

E. Column Isolation from Masonry: Continuously wrap steel columns or structural supports within masonry walls with expansion joint filler sheets (column isolation). Secure sheets with light gauge wire.

3.08 SOURCE QUALITY CONTROL

A. Masonry Contractor shall water test cavity to verify all water is draining to the exterior through the weeps before continuing with exterior wythe before capping wall.
   1. Contractor shall perform tests in the presence of, A/E, testing lab representative, and General Contractor.
      a. Do not proceed more than 3 veneer courses above flashing without testing, observation, and picture documentation by testing lab representative.
   2. Contractor shall hold water hose and with standard water pressure force water into the cavity at a cell vent so water can be observed coming out adjacent weeps for a period of at least 5 minutes. Contractor shall continue down the wall to the next cell vent where a weep did not indicate water wicking out and continue this process until the entire length of flashing is tested.
   3. Where water is observed inside the building or outside the building away from the weeps, masonry units shall be removed and flashing re-inspected and repaired.
   4. Water test shall be re-performed where flashing was repaired.

END OF SECTION 04 05 23

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Clay facing brick.

C. Split Face Concrete Masonry Units

1.02 RELATED REQUIREMENTS

A. Section 04 05 13 - Masonry Mortaring

B. Section 04 05 16 - Masonry Grouting

C. Section 04 05 19 - Masonry Anchorage & Reinforcing

D. Section 04 05 23 - Masonry Accessories

E. Section 05 50 00 - Metal Fabrications: Steel lintels.

F. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.

G. Section 07 21 13 - Board Insulation: Insulation for cavity spaces.

H. Section 07 84 00 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

I. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2018.

B. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2014.

C. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.

D. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2011.

E. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2014.

F. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2021.

G. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

H. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar; 1992a (Reapproved 2014).

I. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting two weeks before starting work of this section; require attendance by all relevant installers, architect and structural engineer.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for specified items.

C. Shop Drawings: Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
   1. Provide elevations of shear wall reinforcing.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
   2. Where one wythe of multi wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place

1.07 MOCK-UP

A. See Section 01 43 00-Quality Assurance.

B. Mockups: Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials, execution, and aesthetic effect.
   1. Build mock-up of typical wall area(s) as shown on Drawings including Movement Control Joints (Sealant Filled) 1'4" (minimum length), Air Barrier, Blocking for Window, Horizontal and Vertical Reinforcing, Shelf Angles and Supports, Bond Beams and Lintels, Brick Ties and Anchors Flashing, End Dams, Weeps and Vents, Cavity Drainage Material (if required), Window Head, Sill and Jamb Details.
      a. Include a sealant-filled joint at least 16 inches long in each exterior wall mock-up.
      b. Include lower corner of window opening at upper corner of exterior wall mock-up. Make opening approximately 12 inches wide by 16 inches high.
      c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mock-up approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
   2. Prior to starting general masonry cleaning, prepare mock-up for cleaning using the same cleaning materials and methods proposed for the Work.
   3. Protect accepted mock-ups from the elements with weather-resistant membrane.
   4. The construction of the mock-up shall be photographed or videotaped by the masonry contractor to be part of a presentation for groups of trades people as they join the project work force.

C. Locate where directed.
   1. Finish face is to be facing south

D. Obtain Architect's acceptance of visual qualities of the panel before starting of masonry work

E. Mock-up may not remain as part of the Work.

F. Retain mock-up during the duration on construction as a standard for judging completed masonry.

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.

1.09 ENVIRONMENTAL 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. Hot Weather Requirements: Comply with IMIAWC (HW).

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Manufacturer: The concrete block manufacturer shall be a member of the National Concrete Masonry Association.
   1. Obtain masonry units from one manufacturer to provide uniform texture and color for each kind required for each continuous area and visually related area.
   2. All concrete masonry units in fire rated partitions shall be equal to UL Classification D-2 (2 hour)

B. 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. Special Shapes: Provide non-standard blocks configured for corners, lintels, control joint edges, and other detailed conditions.
      a. Use bullnose units at all exposed corners, window jambs and sills.
      b. Use special 45 degree corner units.
   3. Load-Bearing Units: ASTM C 90, normal weight.
      a. Normal weight, density 125 pcf or greater
      b. Hollow block, as indicated.
      c. Type II - Nonmoisture controlled
      d. Compressive Strength: 2600 psi. minimum average net area compressive strength.
      e. Exposed Faces: Manufacturer's standard color and texture where indicated.
   4. Non-Loadbearing Units: ASTM C 90, normal weight
      a. Normal weight, density 125 pcf or greater
      b. Both hollow and solid block, as indicated.
      c. Compressive Strength: 2600 psi. minimum average net area compressive strength.
      d. Exposed faces: Manufacturer's standard color and texture.

C. Split-Faced Texture Unit
   1. Acceptable Manufacturers:
      a. Wayne Builder's Supply, Greenville, Ohio
      b. Chas Svec; Artic White
      c. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Split-Faced Block: Full Plane split face with Integral color and waterproofing
      a. Basis of Design : Wayne Builder's Supply
         1) Color #1: White, split face
   3. Size: Units with nominal face dimensions of 8 x 16 inches and nominal depths as indicated on the drawings for specific locations.
   4. Special Shapes: Provide non-standard blocks configured for corners, lintels, control joint edges, and other detailed conditions.
      a. Use special 45 degree corner units.
   5. Color: As selected from manufacturer's full line of standard colors.

2.02 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
   1. Efflorescence: ASTM C67, "non effloresced"

2. Color and texture: as selected by Garmann/Miller Associates Inc..
3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
4. Compressive strength: As indicated on drawings, measured in accordance with ASTM C67/C67M.

B. Athletic Complex
1. Brick Type 1 (Alternate): Belden Brick Company
a. Size: Modular
b. Color: Beaver Blend 73
c. Texture: Dart Tex

C. Elementary School (Alternate)
1. Field Brick: Bowerston Shale
a. Size: Utility - 4 x 12 x 4
b. Color: Chocolate
c. Texture: Wirecut
2. Accent Brick: Glen Gery
a. Size: Utility - 4 x 12 x 4
b. Color: R83 Boulder Gray

D. Substitutions: See section 01 60 00-Product Requirements.

2.03 MORTAR AND GROUT MATERIALS

A. Masonry Mortaring: Refer to Section 04 05 13

B. Masonry Grouting: Refer to Section 04 05 16

2.04 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.

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. Clean reinforcement of loose rust

C. 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. Cold Weather Construction: Comply with whichever is the more stringent:
1. The cold weather construction provisions of TMS 602/ACI 530.1/ASCE 6, Article 1.8 C, shall be implemented when the ambient temperature falls below 40 degrees F (4 degrees C)
2. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
3. Frozen Materials and Work:
a. Do not use frozen materials mixed or coated with ice or frost.
b. Do not build on frozen work.

c. Remove and replace masonry work damaged by frost or freezing.

B. Hot Weather Construction: Comply with whichever is the more stringent:
   1. Hot Weather Construction: The cold weather construction provisions of TMS 602/ACI 530.1/ASCE 6, Article 1.8 C, shall be implemented when the ambient temperature exceeds 100 degrees F (37.8 degrees C), or 90 degrees F (32.2 degrees C) with a wind velocity greater than 8 mph (3.58 m/s).
   2. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

3.04 INSTALLATION GENERAL

A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement type joints, returns, and offsets.
   1. Avoid the use of less than half size units at corners, jambs, returns, offsets and where ever possible.

B. Thickness: Build masonry walls to the full thickness shown except single width walls to be nominal unit thickness.

C. Cut masonry units with motor driven saw designed to cut masonry with clean sharp unchipped edges.

3.05 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

D. Split Face Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Coursing:
      a. Nominal 8 high units: One unit and one mortar joint to equal 8 inches
      b. Nominal 16 high units: One unit and one mortar joint to equal 16 inches
      c. Nominal 4 high units: One unit and one mortar joint to equal 4 inches
   4. Mortar Joints: Concave.

E. Brick Units:
   1. Bond: Running.
   2. Coursing: Two units and two mortar joints to equal 8 inches.
   3. Mortar Joints: Concave.

3.06 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
   1. Cut masonry units with a motor -driven saw designed to cut masonry.

H. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, or cavity insulation vapor barrier adhesive is applied.

I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.07 CONTROL JOINTS

A. Install control joints
   1. Where shown on the drawings
   2. In accordance with the National Concrete Masonry Association (NCMA) recommendations.

B. Do not continue horizontal joint reinforcement through control or expansion joints.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

D. Size control joints as indicated on drawings; if not shown, 3/8 inch wide and deep.

E. Column Isolation from Masonry: Continuously wrap steel columns or structural supports within masonry walls with expansion joint filler sheets (column isolation). Secure sheets with light gauge wire.

3.08 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Fill cores in hollow concrete masonry units with grout 3 course (24 inches) under bearing plates beams posts and similar items, unless otherwise indicated.

E. Do not build into masonry construction organic materials that are subject to deterioration.

3.09 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

C. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

D. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

3.10 CUTTING AND FITTING

A. Cut and fit for built in items and built in items. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.11 SOURCE QUALITY CONTROL

A. Masonry Contractor shall water test cavity to verify all water is draining to the exterior through the weeps before continuing with exterior wythe before capping wall.
   1. Contractor shall perform tests in the presence of, A/E, testing lab representative, and General Contractor.
      a. Do not proceed more than 3 veneer courses above flashing without testing, observation, and picture documentation by testing lab representative.
   2. Contractor shall hold water hose and with standard water pressure force water into the cavity at a cell vent so water can be observed coming out adjacent weeps for a period of at least 5 minutes. Contractor shall continue down the wall to the next cell vent where a weep did not indicate water wicking out and continue this process until the entire length of flashing is tested.
   3. Where water is observed inside the building or outside the building away from the weeps, masonry units shall be removed and flashing re-inspected and repaired.
   4. Water test shall be re-performed where flashing was repaired.

3.12 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 43 00 - Quality Assurance.
   1. The owner is to engage and compensate the on site testing agency.

B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

C. Masonry Inspection
   1. Provide masonry inspection of concrete or brick masonry walls as required to insure that masonry construction is in conformance with the Contract Documents.
   2. The masonry inspector shall prepare a written report or reports for each day of inspection. Masonry Inspection report that follows Section 01 45 25 shall be used for the reports.
   3. The masonry inspector shall be present and observe all grouting operations in wall requiring inspection. The masonry inspector shall be present at the project site with in sufficient time, in advance of grouting operations, to inspect the construction to insure its conformance to the Contract Documents and that grouting may proceed. Periodically the masonry inspector shall be present during the placement of masonry units and reinforcement.
   4. No grouting shall be permitted unless the masonry inspector is present and has indicated that the masonry construction is properly prepared for grouting operation.

3.13 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.14 PROTECTION

A. Protect installed units from splashing, stains, mortar, and other damage.

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

END OF SECTION 04 20 00

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 01 Specifications, apply to this section.

1.02 DESCRIPTION

A. Work included: All labor and materials required to furnish and install structural steel work shown on the Drawings and required by these Specifications, including that shown on Mechanical or Electrical Drawings, or required in their Specification sections.

B. Related work specified elsewhere: The general provisions of the Contract apply to the work of this Section, as though reproduced herein. Carefully examine all other sections and all Drawings for related work.

C. Work furnished but not installed under other Sections: Anchor rods, loose bearing and base plates, loose lintels, and connection hardware to be cast into concrete or masonry.

D. Work affected by others: Mechanical equipment support framing, equipment loads, framing around openings, and structure in any way related to mechanical requirements is shown for bidding purposes only. Responsibility for coordinating the work of this Section with these requirements is solely that of the Contractor. Contractor's review of shop drawings will be taken to indicate that this coordination has been completed.

1.03 QUALITY ASSURANCE

A. Reference Standards:
   1. By the American Institute of Steel Construction (AISC):
      a. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
      b. Specification for Structural Joints Using High-Strength Bolts.
      c. Code of Standard Practice for Steel Buildings and Bridges.
   2. By the American Welding Society (ANSI/AWS):
      a. Structural Welding Code-Steel (AWS D1.1)
      b. Symbols for Welding, Brazing, and Non-Destructive Testing (A2.4).

B. Fabricator's qualifications:
   1. Minimum five years' continuous experience in the fabrication of steel for projects of similar quality and scope.
   2. Certified in the American Institute of Steel Construction's (AISC) Quality Certification program.

3. If Fabricator is not certified with AISC, in accordance with chapter M and N of the AISC manual, the following minimum shop inspections for structural steel fabrication are required:
   a. Shop welding, high-strength bolting, and details.
   b. Shop cut and finished surfaces.
   c. Shop heating for straightening, cambering, and curving.
   d. Tolerances for shop fabrication.
4. These inspections and certifications are to be paid for at the Contractor's expense and are treated as an additional item in fulfilment of project Special Inspections set forth by the Jurisdiction's requirements. Inspection Agency must be qualified to perform shop inspection with knowledge and experience of steel construction. Submit Inspector qualifications for approval by Architect.

C. Erector's qualifications: Minimum five years' continuous experience in similar steel erection.

D. Welders' qualifications: Personnel and procedures are to be qualified per the requirements of the American Welding Society, as given in ANSI/AWS D1.1.

1.04 PERFORMANCE REQUIREMENTS

A. Connections: Select or design connections per AISC standards for forces and moments provided on the Drawings.
1. AISC Code of Standard Practice Connection Design Option 2 (connection selected by an experienced steel detailer utilizing standard AISC connection tables) shall be used where only shear reactions are provided and the geometry complies with the limitations of the tables in the AISC Manual of Steel Construction.
2. Reactions provided are service level forces (ASD). Minimum shear reaction to be 15 kips. Shear reactions below 15 kips are not necessarily listed on the Drawings.
3. Minimum bolt diameter and grade is 3/4 inch diameter A325. Connection shall extend a minimum of one half the beam's 'T' dimension.

1.05 SUBMITTALS

A. Certification of experience: Submit, on request only, written description of personnel, projects, and equipment which document the experience and qualifications required of the Fabricator, Erector, and Welder.

B. Shop Drawings: Provide dimensioned erection plans with appropriate sections and details including member piece details that include the following:
1. Include all shop and erection details, including cuts, copes, cambers, connections, holes, threaded fastener types, sizes and lengths, washers, and weld types, sizes, and lengths.
2. Include embedment layout drawings.
3. Include material specifications and finishes.
4. Indicate shop and field welds with symbols per ANSI/AWS A2.4

C. Certification: Submit, on request only, the following:

1. Certified copies of mill test reports with properly identified material.
2. Certificates of Compliance for:
   a. Structural steel shapes.
   b. Shear studs.
   c. High-Strength threaded fasteners.
   d. Direct-tension indicators.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery:
   1. Members to be hot-dip galvanized shall retain compliance with ASTM A6 after the galvanizing process. Non-compliance will be cause for rejection.
   2. Deliver anchor rods and other items to be embedded in cast-in-place concrete or masonry prior to the start of that work. Provide setting drawings, templates, or instructions required for the installation of such items.

B. Storage:
   1. Store steel at the site above ground on platforms, skids, or other supports.
   2. Protect steel from corrosion.
   3. Store packaged materials in their original unbroken packages.

PART 2 PRODUCTS

2.01 MATERIALS

A. Structural steel wide flange, W shapes:
   1. Fy = 50 ksi, ASTM A992.

B. Structural steel M, S, HP shapes, Channels, Angles, plates, bars, etc.:
   1. Fy = 36 ksi, ASTM A36.

C. Structural steel tubing:
   1. Round steel pipe: Fy = 35 ksi, ASTM A53, Type E or S, Grade B.
   2. Square and Rectangular HSS: Fy = 50 ksi, ASTM A500, Grade C.

D. Anchor Rods: Provide heavy washers for anchor rods.
   1. Threaded and nutted: ASTM F1554, Grade 36

E. High-Strength Bolts: ASTM A325 of A490.

F. Tension Controlled Connections:
   1. Direct-Tension Indicators, compressible-washer-type: ASTM F959, Type A325 of A490.
   2. High-Strength twist-off-type Tension Controlled bolts: ASTM F1852, Type 1 with round of heavy heax head.

G. Post-Installed Anchors:
   1. Install post-installed anchors in accordance with the Manufacturer's installation instructions.

H. Welding Electrodes: Conform to the requirements of ANSI/AWS D1.1, using Series E70 electrodes, appropriate for the materials being welded.

I. Headed Stud Shear Connectors: Conform to the requirements of ANSI/AWS D1.1, Chapter 7, Type B, and ASTM A108, minimum Fy = 65 ksi.

J. Shop Paint Primer:
   1. Primer to be compatible with finish paint.
   2. Interior exposure, normally dry conditions (SSPC Environmental Zone 1A) or Exterior exposure, normally dry conditions (SSPC Environmental Zone 1B): SSPC Paint 25.

K. Galvanizing Repair Paint: High zinc-dust-content paint for re-galvanizing field welds and repairs containing not less than 93 percent zing dust by weight: SSPC Paint 20.

2.02 FABRICATION

A. Conform to applicable provisions of the reference standards listed in Part 1 of this Section, as modified herein.
   1. Connection type is to be:
      a. Snug-tight unless noted otherwise.
      b. Slip-Critical where specifically shown on the Construction Drawings. Provide twist-toff tension controlled bolts or direct-tension indicating washers at all locations.
   2. Bolted connections shall be made with High-Strength bolts (A325 or A490). Standard bolts and nuts are permitted only where specified on the Drawings.

B. Camber: Provide camber in beams as indicated on the drawings.

C. Finishing: Ends of members in direct contact bearing, such as columns at their bases and splices, are to be "finished", as defined in the Code of Standard Practice.

D. Bearing and base plates: Column base plates are to be shop attached. Beam bearing plates may be attached or loose.

E. Holes: Drill or punch holes in members as required for passage of conduit and piping, and attachment of joists, nailers, etc. burning such holes is not permitted without prior approval of the Architect. If opening is not shown on structural Drawings, obtain prior approval.

F. Cleaning:
   1. Remove oil, dirt, loose mill scale, or other material that would impair welding performance of friction-type connections.
   2. For steel that is to be painted, cleaning techniques are to be as required by the appropriate SSPC paint specification.

G. Shop Priming: Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar.
   2. Surfaces to be field welded.
   3. Surfaces of high-strength bolted, slip-critical connections.
   4. Galvanized surfaces.

5. Surfaces enclosed in interior; dry construction not exposed to view in finished structure.

H. Painting:
1. Steel not exposed to view in the finished structure need not be painted.
2. Steel exposed to view, except that to be galvanized is to be painted as follows:
a. Other interior exposure: Apply one-coat shop paint system in accordance with SSPC-PS 7.01. Apply two coats to surfaces inaccessible after assembly.

I. Galvanizing: Where required, galvanizing is to conform to ASTM A123 and A153. Except for bolts, nuts, and anchors, all galvanizing is to be done after fabrication.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Prior to beginning work of this Section, verify that the installed work of other trades is complete and correct to the extent necessary for the proper execution of the work of this Section. This includes locations of anchor rods, bearing plates, bearing areas, and finished elevations of concrete and concrete masonry.

B. In the event of discrepancies, immediately notify the Architect. Do not proceed with work affected by the discrepancies until they have been resolved.

3.02 ERECTION

A. Conform to the applicable provisions of the reference standards listed in Part 1 of this Section, as modified herein.

B. The structure is designed to be self-supporting and stable after the building is fully completed. It is solely the Contractor's responsibility to determine erection procedure and sequence; and to ensure the stability of the building and its components and parts, and of the adequacy of temporary or incomplete connections during erection. This includes the addition of whatever temporary bracing, guys, or tie-downs that might be necessary. Such material is not shown on the Drawings. If applied, they shall be removed as conditions permit, and shall remain the Contractor's property.

C. Safety: It is the Contractor's responsibility to follow all applicable safety codes and regulations governing this work.

D. Clean bearing surfaces and other surfaces in permanent contact with each other prior to assembly.

E. Splices are permitted only where indicated.

F. Tolerances: Per AISC Code of Standard Practice.

G. Field corrections of fabrication errors by gas cutting is not permitted in major members without prior approval of the Architect.

H. Welds that are subject to foot traffic or are exposed to view in the finished structure are to be ground smooth and flush with adjacent surfaces.

I. Touch-up painting: After erection, touch-up field connections and abrasions in the shop coat with same paint used for shop coat. Do not paint welds until they have been cleaned in accordance with AWS D1.1.

3.03 FIELD QUALITY CONTROL

A. Inspection and testing shall be in accordance with Special Inspections designated for this project as approved by the Building Official. Special Inspections must be documented with all corrective measures completed to satisfy compliance certificates as deemed necessary by the Jurisdiction.

END OF SECTION

SECTION 05 21 00
STEEL JOISTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this section.

1.02 DESCRIPTION

A. Work included: All labor and materials required to furnish and install steel joist work shown on the Drawings and required by these Specifications. Include all bridging, ceiling extensions, anchors, extended ends, bearing plates, and other accessories required for a complete installation.

B. Related work specified elsewhere: The general provisions of the Contract apply to the work of this Section, as though reproduced herein. Carefully examine all other sections and all Drawings for related work.

1.03 QUALITY ASSURANCE

A. Reference Standards, by the Steel Joist Institute (SJI) and the American Institute of Steel Construction (AISC):
   1. Standard Specifications for Open Web Steel Joists (K-series).
   2. Standard Specifications for Longspan Steel Joist (LH-series) and Deep Longspan Steel Joists (DLH-Series).

B. Manufacturer's qualifications: A manufacturer certified by Steel Joist Institute (SJI) to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications".

C. Welders' qualifications: Personnel and procedures are to be qualified per the requirements of the American Welding Society, as given in ANSI/AWS D1.1.

D. Tolerances:
   1. Sweep: Maximum 1/480 of joist length.
   2. Spacing: Maximum 1" variation, throughout full joist length.
   3. Plumbness: 1/4 inch per foot of joist depth.

1.04 SUBMITTALS

A. Shop Drawings:
   1. Provide a dimensioned layout or erection drawing that indicates mark, number, type, and location of all joists.

2. Indicated all bridging, including size, attachment to the joists, and anchorage of bridging at the ends of each line.
3. Indicate connection details including locations and details of bearing plates.
4. Indicate paint type, and all accessories required for the proper and complete installation of joists. Include handling and erection instructions.
5. For K-series special joists, provide load diagrams stating all distributed and concentrated loads applied to the joist. These loads shall correspond to the loads shown on the structural contract drawing.
6. Shop Drawings are to be sealed by a Professional Engineer registered in the same state as the project site.

B. Certification: Submit, on request only, the following:
1. Certified copies of mill test reports.
2. Inspection reports for field connections, including splices.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications".

B. Deliver anchor rods, bearing plates, and other items to be embedded in cast-in-place concrete or masonry prior to the start of that work. Provide setting drawings, templates, or instructions for the installation of such items.

C. Provide tags on joists for ready identification.

D. Store joists off ground, in upright position. Protect from corrosion and keep free of dirt and other detrimental substances.

E. Store and handle joists to avoid damage. Repair or replace damaged joists.

PART 2 PRODUCTS

2.01 MATERIALS

A. Joist: Comply with the requirements of SJI "Specifications".

B. Bearing Plates, Bridging, and Accessories: ASTM A36, Fy = 36 ksi.

C. Anchor Rods: ASTM A307.

D. Paint: SSPC-Paint 15, or manufacturer's standard red oxide or gray complying with performance requirements of SSPC-Paint 15, except that black asphalt is not permitted. Do not paint steel to receive fire-proofing.

E. Welding electrodes: Conforms to requirements of ANSI/AWS D1.1 using Series E70 electrodes, appropriate for the material being welded.

2.02 DESIGN CRITERIA

A. Round bar chords are not permitted.

B. Extended ends are to be designed for loads on Drawings. If none are given, design for the same load (lbs./lin. ft.) as the joist.

C. Provide ceiling extensions in areas scheduled to receive contract or suspended ceilings.

D. Bridging:
   1. For K-Series joists, use horizontal bridging, except where diagonal bridging is specifically shown on Drawings. Connections to joists and to each other at points of intersection to be welded.
   2. For LH-Series and DLH-Series joists, use diagonal bridging. Connections to joists and each other to be bolted.
   3. Bridging shown on the drawings is schematically indicated. Detail, fabricate, and install bridging in accordance with SJI requirements. Provide additional bridging as required for stability.
   4. Design roof joists and bridging for a net uplift (ASD) of 10 psf, unless higher loading is indicated on plans. Provide additional bridging as required.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Prior to beginning work of this Section, verify that the installed work of other trades is complete and correct to the extent necessary for the proper execution of the work of this Section.

B. In the event of discrepancies, immediately notify the Architect. Do not proceed with work affected by the discrepancies until they have been resolved.

3.02 ERECTION

A. General: Install joists and accessories plumb, square and true to line and in conformance with the requirements of SJI "Specifications".

B. Install temporary and permanent bridging with joist erection before joist support construction loads. Comply with Erection Stability and Erection requirements of SJI "Specifications".

C. Concentrated loads: Provide reinforcing for chords or webs as required at points of concentrated loads.

D. Touch-up painting: after installation, touch-up unpainted areas, connections, and abrasions in the shop coat with the same paint used for the shop coat.

3.03 FIELD QUALITY CONTROL

A. Inspection and testing shall be in accordance with Special Inspections designated for this project as approved by the Building Official. Special Inspections must be documented with all corrective measures completed to satisfy compliance certificates as deemed necessary by the Jurisdiction.

END OF SECTION

SECTION 05 31 00
METAL DECKING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications, apply to this section.

1.02 DESCRIPTION

A. Work included: All labor and materials required to furnish and install metal decking and accessories including closures, hanger tabs, edge filler plates, ridge and valley plates, end enclosure angles, and roof sump pans were shown on the Drawings and or required for a complete installation.

B. Related work specified elsewhere: The general provisions of the Contract apply to the work of this Section, as though reproduced herein. Carefully examine all other sections and all Drawings for related work.

1.03 QUALITY ASSURANCE

A. Reference Standards:
   1. Specification for the Design of Cold-Formed steel Structural Members, current edition, by the American Iron and Steel Institute.
   2. Design Manual for Floor Decks and Roof Decks, by the Steel Deck Institute (SDI)

B. Manufacturer's qualifications: Regularly engaged in the manufacture of similar decking.

C. Erector's qualifications: Minimum five years' experience in installation of similar decking.

D. Welder's qualifications: Personnel and procedures are to be qualified per the requirements of the American Welding Society as given in AWS D1.1.

1.04 SUBMITTALS

A. Certification of experience: Submit, on request only, written description of personnel, projects, and equipment which document the experience and qualifications required of the manufacturer, erector, and welders.

B. Shop Drawings:
   1. Provide a deck placement plan that indicates mark, number, type, finish, dimensions, and location of deck units. Include details and locations of sump pans, openings, and all accessories.
   2. Indicated method of attachment to supporting members.

3. Indicate details and installation instructions for all types of decking and all accessories.
4. Indicate sequence of installation, where critical.

C. Manufacturer's Certification:
1. Certify compliance with structural criteria. Published load tables and literature are usually acceptable. Provide design calculations on request only.
2. Certify compliance with finish criteria with test reports as required.
3. Furnish evidence of listing in Underwriter's Laboratory for the specified U.L. Design Assembly.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Prevent damage to deck or finish during delivery, handling, and storage. Store on blocking or platforms, off the ground, with one end elevated for drainage.

B. Protect from rusting with waterproof covering, or storage under roof. Follow manufacturer's instructions for storage and protection of deck surfaces that are not painted or galvanized.

PART 2 PRODUCTS

2.01 DESIGN CRITERIA

A. Roof deck:
1. Type: 1-1/2 inches deep, 22 ga. Minimum, wide rib (per SDI).
2. Finish: Galvanized.
3. Other: Structural requirements as given on Drawings.

B. Acoustical roof deck:
1. Type: 1-1/2 inches deep, 22 ga. Minimum, wide rib acoustic. Holes to be 1/8-inch minimum on 3/8-inch centers, staggered pattern. acoustic
2. Finish: Galvanized.
3. Other: Structural requirements as given on Drawings.

C. Deep rib acoustical roof deck:
1. Type: 3 inches deep, 20 ga. Minimum, deep rib acoustic. Holes to be 1/8-inch minimum on 3/8-inch centers, staggered pattern. acoustic
2. Finish: Galvanized.
3. Other: Structural requirements as given on Drawings.

D. Metal Form Deck (Conform):
1. Type: 1 inches deep, 22 ga. Minimum, wide rib, corrugated.
2. Finish: Galvanized.
3. Other: Structural requirements as given on Drawings.

2.02 MATERIALS AND FINISHES

A. Materials: Steel sheet conforming to ASTM A653 or A611 with minimum yield strength of 33 ksi.

B. Finishes:
   1. Galvanized: Conform to ASTM A653, G60.

C. Accessories: Same material and finish as deck units, except that interior closures may be of compressible material.

D. Sound insulation: Glass fiber type. Required in areas with acoustical roof deck.

E. Field touch-up paint:
   1. For galvanized deck: use zinc chromate paint.

2.03 FABRICATION

A. Units are to be continuous over at least three spans, where possible. Where units are single or double-span, use heavier gauge if required for stress or deflection control. End laps are to occur over supports.

B. Units are to have nested side laps, except for metal centering units.

C. Decking shall be finished such that field paint or sprayed fireproofing can be applied without further preparation.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Prior to beginning work of this Section, verify that the installed work of other trades is complete and correct to the extent necessary for the proper execution of the work of this Section.

B. In the event of discrepancies, immediately notify the Architect. Do not proceed with work affected by the discrepancies until they have been resolved.

3.02 ERECTION

A. Install decking in accordance with approved Placement Drawings.

B. Tolerance: Align adjacent units with 1/4 inch in 40 feet.

C. Attach metal deck to supports as indicated in the Structural Drawings and should resist the following:
   1. Welding: Attach supports by welding from topside only. Any welds that burn hole in decking or supporting member will be rejected. Minimum size and

spacing of welds to be as recommended by the manufacturer or as shown on the Drawings. Additional requirements are as follows:

a. Roof Deck: Attach to resist the required gross uplift force, but not less than 45 pounds per square foot in eave overhang areas; and not less than 30 pounds per square foot in all other areas. Minimum attachment is to be 5/8-inch diameter fusion welds spaced at 6-inches at end laps and at 12-inches at intermediate supports, including side laps.

b. Metal Form Deck: Minimum attachment is to be 5/8-inch diameter fusion welds spaced at 15-inches at end laps and at 30-inches at intermediate supports.

2. Direct Fastening: Attach to supports by direct fastening from topside only. If direct fastening is preferred as an alternate by the Contractor, submit signed and sealed shop drawings indicating fastener size and spacings that meet or exceed the welded connection capacity of the deck as indicated in the structural drawings.

D. Sidelap Fastening: Method as recommended by manufacturer. Spacing not to exceed 3-feet.

E. Closures: Install in deck flutes over supports or other construction at building perimeter and a perimeter of interior rooms. Set in a true even line, flush with construction below, eliminating any shelf or pocket. Closure are to be accurately shaped and installed, to provide a tight fit.

F. Openings: Field cut small openings, bevels, miters, etc. as required. Provide additional support for openings exceeding 9-inches in width.

G. Hanging Loads: Do not hang items other than suspended ceilings from the underside of metal decks, unless specifically approved by the Architect.

H. Construction Loads:

1. Do not use deck as storage or working platform until it has been permanently attached to supports. Assure that construction loads do not exceed the carrying capacity of the deck.
2. Deck as formwork: In metal deck applications which receive concrete fill, the deck is designed to support the self-weight of deck, concrete and a uniform construction live load of 20 psf, which is considered adequate for typical construction applications that consist of concrete transport and placement by hose and concrete finishing hand tools.

I. Repair and Touch-up:

1. At areas where deck will be exposed to view, remove and replace any units with damage or defect that cannot be concealed by painting.
2. Where deck will not be exposed to view, repair any cuts and holes with plate of same gauge as deck.
3. Touch-up all damaged areas of finish, on both top and bottom sides of deck.

3.03 FIELD QUALITY CONTROL

A. Inspection and testing shall be in accordance with Special Inspections designated for this project as approved by the Building Official. Special Inspections must be documented

with all corrective measures completed to satisfy compliance certificates as deemed necessary by the Jurisdiction.

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this section.

1.02 DESCRIPTION

A. Work included: All labor and materials required to design, furnish, and install cold-formed metal framing as shown on the Drawings and or required by these specifications. Cold-formed metal framing includes:
   1. Exterior non-load-bearing curtain-wall and soffit framing.
   2. Related accessories and necessary fasteners to complete the system.

B. Related work specified elsewhere: The general provisions of the Contract apply to the work of this Section, as though reproduced herein. Carefully examine all other sections and all Drawings for related work.

C. Provide openings and special framing required by other trades. Equipment framing, loads, openings, and structure are shown for bidding purposes only. Obtain approval of other trades before proceeding with such work. Coordinate work with mechanical and electrical requirements.

D. Field measurement of the existing construction shall be conducted when required to ensure the proper coordination and fit of new work.

1.03 QUALITY ASSURANCE

A. Standards: Comply with American Iron and Steel Institute (AISI) "Specifications for the Design of Cold-Formed Structural Steel Members", except as otherwise indicated.
   1. The minimum uncoated thickness of the cold-formed metal framing delivered to the project shall not be less than 95% of the design thickness indicated. Lesser thicknesses shall be permitted at the bends due to cold forming.

B. Welding of CFMF: Comply with American Welding Society, AWS D1.1 "Structural Welding Code – Steel" and AWS D1.3 "Structural Welding Code – Sheet Steel". Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

C. Provide each type of cold-formed metal framing required produced by one manufacturer.

D. Reference Standards:
   1. American Society for Testing and Materials (ASTM):

a. ASTM A653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot-Dip Process".
b. ASTM A780 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings".
c. ASTM A924 "Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process".
d. ASTM A1003 "Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members".
e. ASTM C955 "Standard Specification for Load bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases".
f. ASTM C1007 "Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories".

2. American Welding Society (AWS):
   a. AWS A2.4 "Symbols for Welding and Nondestructive Testing".
   b. AWS D1.1 "Structural Welding Code-Steel".
   c. AWS D1.3 "Structural Welding Code – Sheet Steel".
3. Association of Wall and Ceiling Industries-International (AWCI) and Metal Lath/Steel Framing Association (ML/SFA)
   a. AWCI-ML/SFA "Steel Framing Systems Manual".

1.04 PERFORMANCE REQUIREMENTS

A. Provide cold-formed metal framing capable of withstanding design loads and within deflection limits indicated.

B. Design Loads: Occupancy Live, Roof Live, Snow, Wind, and Seismic loads shall be as indicated in the General Structural Notes on the Structural Drawings.

C. Deflection Limits: Design framing systems to withstand the total design loads without the deflection exceeding the following:
   1. Exterior wall framing horizontal deflection where "L" is the stud height:
      a. Supporting flexible finishes (including EIFS): L/240
      b. Supporting Portland Cement-based Plaster (Stucco): L/360
      c. Supporting masonry, brick, or stone finishes: the more stringent of L/600 or 3/8".
      d. Supporting extremely brittle finishes: L/720 or as defined by finish manufacturer.
   2. Interior wall framing horizontal deflection where "L" is the stud height and the applied horizontal live load is 5 psf (ASD) loading:
      a. Supporting flexible finishes: L/240.
      b. Supporting brittle finishes: L/360.
   3. Soffit joist framing vertical deflection where "L" is the horizontal span of the joist:
      a. Total Loads: L/360.

D. Design non-load bearing curtain wall framing and connections to accommodate 3/4-inches vertical deflection of the building framing due to live load deflections and construction tolerances.

1.05 SUBMITTALS

A. Submit Manufacturer's product data and installation instructions for each type of cold-formed metal framing and accessory required.

B. Delegated design:
   1. Stud size and details shown on the Drawings indicate general installation and connection methods. Complete detail of components for all loads and forces is to be shown on the Shop Drawings. No changes from sizes and installation methods shown on the Construction Drawings will be permitted without verification that the design criteria cannot be met and without express written consent of the Architect and the Engineer of Record.
   2. Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in the jurisdiction where the project is located and who is experienced in providing engineering services for installations of cold-formed metal framing that are similar to those indicated for this project in material, design, and extent.
   3. Shop drawings must include structural analysis data of all cold-formed metal framing and connections in conformance with design loads stated on the Structural Drawings. Shop drawings and analysis must bear the seal of the qualified Engineer responsible for their preparation.

C. Shop Drawings: submit drawings for approval that include the following minimum information:
   1. Fully dimensioned plans and elevations with cross sections and details depicting all component member locations, orientations, and layout.
   2. Wall, Floor, and/or Roof member sizes and gauge designations, number, type and spacing.
   3. Supplemental strapping, bracing, bridging accessories, and details required for proper installation.
   4. Details of connections that indicate screw types, quantities, locations, weld size and locations, and any other fastener requirements.

D. Supplier's Certification:
   1. The supplier of the cold-formed metal framing shall submit written evidence of having a minimum of five years' experience on projects of similar type and scope, including a description of physical facilities, quality control, methods, personnel experience, and erection capacities.
   2. Cold-formed pre-engineered steel truss manufacturer must adhere to Special Inspection requirements for fabricated items.

E. Welding of cold-formed metal components shall only be performed by operators qualified per AWS D1.1 and D1.3 for the thickness of materials being used. Submit copies of welder certificates upon request only.

F. Upon request only, submit mill certificates from the steel producer.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturers unopened containers or bundles fully identified by name, brand, type, and grade. Exercise care to avoid damage during unloading, storing, and erection.

B. Protect cold-formed metal framing members and accessories from corrosion, deformation, damage, and deterioration when stored at the job site as required in AISI's Code of Standard Practice. Store cold-formed metal framing off the ground on pallets, platforms or other supports, and provide a waterproof covering. Keep cold-formed metal framing free of dirt and other foreign material.

1.07 PROJECT CONDITIONS

A. Coordinate metal frame positioning with trades furnishing items for attachment of built-in members.

B. Promptly furnish anchors, bolts, inserts, clips, and other items required under this section but built in with work of other trades.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Cold-formed metal framing products by the following manufacturers are approved for use on this project: ClarkDietrich Metal Framing; Marino Ware, a division of Ware Industries; United Metal Products, Inc.; Scafco Corp.; and The Steel Network, Inc.

B. Connection component and fastener products by the following manufacturers are approved for use on the project: ClarkDietrich Metal Framing: Marino Ware, a division of Ware Industries; and The Steel Network Inc.

C. Alternate manufacturers of cold-formed metal framing, connection components, and fasteners are to be submitted for review and approval two weeks before submitting bids.

2.02 MATERIALS AND FINISHES

A. Steel sheet: ASTM 1003, Structural Grade, Type H, metallic coated, of thickness and grade as follows:
   1. 33 mils – 0.0346 inches (20 gauge), Fy = 33 ksi.
   2. 43 mils – 0.0451 inches (18 gauge), Fy = 33 ksi.
   3. 54 mils – 0.0566 inches (16 gauge), Fy = 50 ksi.
   4. 68 mils – 0.0713 inches (14 gauge), Fy = 50 ksi.
   5. 97 mils – 0.1017 inches (12 gauge), Fy = 50 ksi.
   6. Track and bridging components shall have a minimum Fy = 33 ksi.
   7. Connection clip angles and vertical or horizontal deflection connections shall have a minimum Fy = 33 ksi.

B. Framing Components: Manufacturer's standard C-shaped cold-formed metal framing having punched and/or un-punched webs with stiffened flanges shall comply with ASTM

C955. Provide sizes, shapes, and gauges indicated. Nomenclature used on the Drawings is designated by: Depth, Shape, Width, and Thickness of framing components. i.e. "600 S162-54".

1. Depth: The number represents the depth of the member multiplied by 100 and expressed as a whole number in inches. i.e. '362' = 3-5/8"; 600' = 6"; '800' = 8".'
2. Shape: 'S' = C-shaped member; 'T' = Track member; 'F' = Furring channel; 'U' = U-shaped member.
3. Width: The number represents the flange width of the member multiplied by 100 and expressed as a whole number in inches. i.e. '162' = 1-5/8"; '200' = 2"; 250 = 2-1/2".
4. Thickness: Expressed in mils as defined above.

C. System Accessories: Provide manufacture's standard steel tracks, bridging, blocking, clip angles, reinforcements, stiffeners, fasteners, braces, and accessories for each type of cold-formed metal framing required. Provide all components recommended by the manufacturer for the applications indicated and as needed to provide a complete metal framing system.

D. Finish:

1. Galvanized: Provide framing components: studs, joists, rafters, and headers with protective zinc coating complying with ASTM A1003, minimum G60 coating.
2. Provide connection components; clip angles, deflection angles, joist hangers, hurricane ties, holdowns, etc. with protective zinc coating complying with ASTM A1003, minimum G90 coating.
3. Galvanized repair paint: Tnemec Co., Inc. – No. 92 "Tneme-Zinc"; SSPC-Paint 20; or an approved equal zinc-rich primer paint.

E. Fasteners:

1. Manufacturer's recommended self-drilling, self-tapping screws, bolts, nuts, and washers with hot-dip galvanized finish complying with ASTM C1513.
2. Anchorage devices: Power-actuated Fasteners (PAF), anchor rods, drilled expansion anchors, or chemical anchors.
3. Welding: Comply with AWS D1.1 when applicable, and AWS D1.3 for welding base materials less than 1/8" thick.

F. Shims: Load-bearing, high-density multimonomer plastic, non-leaching.

2.03 FABRICATION

A. Cut framing to fit squarely against abutting members. Hold members securely in position until properly fastened.

B. Saw cut all field cuts of cold-formed metal framing members and components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members.

C. Attach and join indicated components by welding. Attach and join other components by welding, bolting, or screw fasteners as recommended by the manufacturer. Wire-tying of framing members is not permitted.

PART 3 EXECUTION

3.01 INSTALLATION – GENERAL

A. Install cold-formed metal framing in accordance with ASTM C1007 unless otherwise indicated.

B. Install load bearing shims or grout between underside of wall bottom track or rim track and top of foundation wall or slab at studs or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

C. Install cold-formed metal framing and accessories plumb, square, and true to line according to the manufacturer's written recommendations and requirements in this Section.

D. Connections of cold-formed metal framing members and components are to be securely anchored to the supporting structure according to the manufacturer's written recommendations and requirements of this Section.

E. Do not bridge building expansion joints and control joints with cold-formed metal framing members or accessories. Frame each side of joints with independent members.

F. Install insulation in assemblies and built-up members in exterior framing, such as headers, multiple stud columns and jambs, sills, and boxed beams or joists that are not accessible to the insulation contractor upon erection of framing work.

G. Fasten hole-reinforcing plates over web penetrations that exceed the manufacturer's standard punched openings.

3.02 INSTALLATION – NON-LOAD BEARING CURTAIN WALL STUDS

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately to layout at base and top of studs. Secure tracks at corners, ends, and laps as recommended by the manufacturer for type of construction involved. Securely anchor tracks to building framing as indicated.

B. Squarely set studs against web of tracks and secure studs to top and bottom runner tracks by either welding or fastening with screws at both inside and outside flanges.

C. Set studs plumb except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Isolate non-load bearing curtain wall studs for the building structure to prevent transfer of vertical loads while providing lateral support.

E. Install stud wall bridging (continuous cold-rolled channels positioned through the stud punch-outs) either by welding directly to the stud or attaching with clips. Bridging shall consist of the following:
   1. 3-5/8" and 6" studs: 1-1/2" x 16-ga. channel fastened to each stud with standard clip angles.

2. Proprietary bridging bars provided and installed according to manufacturer's written instructions.
3. A combination of flat, taut, steel straps of width and thickness indicated and stud-track solid blocking of width and thickness to match stud. Fasten straps to stud flanges and secure solid blocking to stud webs or flanges with standard clip angles.
4. Install bridging rows at a maximum spacing of 4'-0" on center.

F. Install supplementary framing, connections, diagonal braces or kickers, blocking, stiffeners, clip angles, and fasteners required to provide a complete and stable curtain wall framing system.

3.03 TOLERANCES

A. Fabricate and install members and assemblies to a maximum allowable variation as follows:
1. Variation from plumb, level, and true to line: 1/8 inch in 10 feet.
2. Variation of member spacing: not more than 1/8 inch plus or minus from spacing indicated. Cumulative error shall not exceed the minimum fastening requirements of the sheathing or other finishing materials.
3. Squareness: fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

3.04 FIELD REPAIRS AND PROTECTION

A. Galvanized repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing, connections, and components with galvanized repair paint according to ASTMA780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer, which ensure cold-framed metal framing is without damage or deterioration at time of Substantial Completion.

3.05 FIELD QUALITY CONTROL

A. Inspection and testing shall be in accordance with Special Inspections designated for this project as approved by the Building Official. Special Inspections must be documented with all corrective measures completed to satisfy compliance certificates as deemed necessary by the Jurisdiction.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items including:
   1. Loose steel lintels
   2. Exterior mechanical yard gates
   3. Foamed-in-place insulation metal closure
   4. Loose bearing and leveling plates
   5. Miscellaneous framing and supports

B. Downspout boots.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 04 20 00 - Unit Masonry: Placement of lintels in masonry.

D. Section 06 2000 - Finish Carpentry: Mechanical gate latch

E. Section 09 91 13 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2022.

D. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).

E. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

F. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

G. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - 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.

C. Samples
   1. Submit samples as requested by the Architect during the course of construction.

1.05 QUALITY ASSURANCE

A. The work of this section shall be coordinated with the work of other Sections.
   1. Verify the dimensions and work of other trades adjoining items of this Section before fabrication and installation.

B. Furnish to the pertinent trades items included in this Section that are built into the work of other Sections.

C. Welding shall be performed by qualified welders and shall conform to the applicable AWS welding code.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation

B. Repair items which have become damaged to the satisfaction of the Architect prior to incorporating them into the work. Replace damaged items if repair cannot be done to the satisfaction of the Architect.

1.07 PROJECT SITE REQUIREMENTS

A. Field measurements shall be taken at the job site, prior to fabrication of items, to verify or supplement indicated dimensions and to ensure proper fitting of all items.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Angles, Channels, and S Shapes: ASTM A 36/A 36M - ASTM 992 (FY = 50ksi)

B. Steel W Shapes: ASTM A 992/A 992M (FY = 50ksi).

C. Rolled Steel Structural Shapes: ASTM A 992/A 992M (FY = 50ksi).

D. Plates and Bar: ASTM A 36, unless otherwise noted.

E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

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

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.
   1. Properly mark and match mark materials for field assembly
   2. Use connections that maintain structural values of joined pieces

B. Fabricate items with joints tightly fitted and secured.
   1. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise shown.
   2. Form bent-metal corners to smallest radius possible without causing grain separation of otherwise impairing work.

C. Continuously seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

G. Cut, reinforce, drill and tap miscellaneous metal work as required to receive finish hardware, screws, and similar items.

2.03 FABRICATED ITEMS

A. Lintels: As detailed; prime paint finish unless otherwise noted/scheduled.
   1. Fabricate loose structural-steel from steel angles and shapes indicated on the drawings.
   2. Weld adjoining members together to form a single unit.
   3. Size loose lintels to provide bearing at each side of opening equal to one-twelfth of the clear span, but not less than 8 inches.
   4. Galvanize after fabrication for use in exterior walls.

B. Foamed-in-place insulation metal closer
   1. Galvanized, 20 gauge thick steel sheet of profile and size shown on the drawings.

C. Exterior mechanical yard gates: (if not already included with the Metal Fencing Section)
   1. Channels and Tubes as detailed on the drawings
      a. Finish: Galvanized.
   2. Exterior gates shall be provided with the following:
      a. Hinges: Product 1035.0026 Disc Bearing, Manufacturer; Richards-Wilcox, Aurora Il., www.richardswilcox.com
         1) Acceptable Manufacturers:
            (a) Crown Industrial, San Francisco, CA; www.crown-industrial.com: Product 9035-P266
            (b) Barn Door Hardware, el Segundo, CA; www.barndoorharware.com; Product 1035 DB 19 inch
            (c) Substitutions: See Section 01 6000- Product Requirements
      b. Cane Bolt: Stanley - Model No. 6322527 capable of being a stored position.
         1) Provide one per door leaf.
            (a) Acceptable Manufacturers:
               (1) Richard-Wilcox; Product: 0524.00021
               (2) McMaster- Carr; Product: 1236A12
               (3) Substitutions: See Section 01 6000 - Product Requirements
      c. Door Latch: Product 0152.00023BZC, Manufacturer; Richard-Willcox, Aurora Il., www.richardswilcox.com

D. Loose Bearing and Leveling Plates
   1. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete. Plates to be free from twist and warps and of required thickness and bearing area. Drill plates for receive anchor bolts and grouting.
   2. Galvanize after fabrication for use in exterior walls.

E. Miscellaneous Framing and Supports
   1. Provide steel framing and supports that are not part of the structural steel framework as necessary to complete the Work.
   2. Fabricate miscellaneous units to sizes, shapes, profiles indicated and necessary to receive adjacent work or work to be retained by framing and supports. Fabricate from structural steel shapes, plates and steel bars of welded construction. Cut, drill, and tap units to receive hardware, hangers, supports, attachments and similar items

2.04 DOWNSPOUT BOOTS

A. Cast Iron Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
   1. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   2. Finish: Manufacturer's factory applied powder coat finish.
      a. Color: Custom color to be selected by Architect.
   3. Reference 07 71 23 Manufactured Gutters, Downspouts and Boots for PVC boots

4. Manufacturers:
    a. Downspoutboots.com, a division of J. R. Hoe & Sons
    b. www.downspoutboots.com

2.05 FINISHES - STEEL

A. Prime paint steel items.
    1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items specified for galvanized finish.
    2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
    3. Exception: Galvanized items to be embedded in exterior walls or surfaces

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.06 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasionsand surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

END OF SECTION 05 50 00

SECTION 05 51 00
METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Structural steel stair framing and supports.

C. Handrails and guards.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements

B. Section 03 30 00 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.

C. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

D. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

E. Section 05 50 00 - Metal Fabrications.

F. Section 05 5213 - Pipe and Tube Railings: Metal handrails.

G. Section 09 91 13 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2009.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).

G. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

C. Design Data: As required by authorities having jurisdiction.

D. Delegated Design:

1. Stair deatils shown on the drawings indicate general installation and connection methods. Complete detail of componets for all loads and forces is to be shown on the shop drawings. No changes from sizes and installation methods shown on the construction drawings will be permitted without verification that the design criteria cannot be met and with express wirtten consent of the Architect and the Engineer of Record.
2. Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in the jurisdiction where the project is located and who is experienced in providing

engineering services for steel stairs that are similar to those indicated for this project in material, design, and extent.

3. Shop drawings must include structural analysis data of all stair framing components and connections to supporting structure in conformance with design loads stated on the Structural Drawings. Shop drawings and analysis must bear the seal of the qualified Engineer responsible for their preparation.

1.05 QUALITY ASSURANCE

A. Perform design and prepare shop drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Ohio.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
   2. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
   3. Dimensions: As indicated on drawings.
   4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
      a. Welded Joints: Continuously welded and ground smooth and flush.
      b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
      c. Exposed Edges and Corners: Eased to small uniform radius.
      d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 2 inches, minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
   4. Pan Anchorage to Stringers: Welded to carrier angles welded to stringers.
   5. Concrete Reinforcement: None.

D. Risers: Same material and thickness as tread pans.
   1. Riser: Solid as shown on the drawings

2. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.
3. Nosing Depth: Not more than 1 inch overhang.
4. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.
5. Abrasives Nosing
    a. Manufacturer:
        1) American Safety Tread; Product Type 8501 with screw anchors color to be selected
        2) Base shall consist of heat treated extruded aluminum alloy 6063-T6.
        3) Abrasive filler shall consist of a mixture of aluminum oxide and silicon carbide granules in an epoxy matrix locked into the extruded channels of the base. The abrasive ribs shall project a minimum of 1/16 inch above the extruded channels.
        4) Nosings run full length of stair.
    b. Acceptable Manufacturers
        1) Wooster Products Inc.
        2) Balco Architectural Products.

E. Stringers: Rolled steel channels.
1. Stringer Depth: As indicated on drawings.
2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings.

H. Finish: Shop- or factory-prime painted.

2.03 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: As specified in Section 05 52 13.

B. Guards: Pipe railings as specified in Section 05 52 13.

2.04 MATERIALS

A. Rolled Steel Floor Plate: ASTM A786/A

B. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011 commercial quality, Type B, or structural quality, Grade 30, unless another grade is required by design loads.

C. Steel Bars for Grating: ASTM A36.

D. Galvanized Steel Sheet: ASTM A653, G90 coating, either commercial quality, Type B, or structural quality, Grade 33, unless another grade is required for design loads.

E. Steel Sections Structural Steel Plates, Shapes and Bars: ASTM A 36/A 36M.

F. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

G. Concrete Fill: Type specified in Section 03 30 00.

2.05 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
2. Number of Coats: One.

D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.

1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

G. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.

H. Obtain approval prior to site cutting or creating adjustments not scheduled.

I. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

J. Abrasive Nosing:
   1. Set nosing in a full bed of construction adhesive to totally seat it into the substrate with no voids.
   2. Anchor to substrate with countersunk expansion anchors.

END OF SECTION 05 51 00

SECTION 05 51 50
ALUMINUM LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vertical fixed aluminum access ladders.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry

B. Section 07 72 45 - Roof Hatches and Vents

1.03 REFERENCES

A. ANSI A14.3 - American National Standared for Ladders - Fixed - Safety Requirements.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes, and Tubes.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's data sheets on each product to be installed, including model number, material, and finish.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with ANSI A14.3.

B. Manufacturer Qualifications:
   1. Firm having 5 years of experience in producing aluminum metal ladders.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging until ready for installation.

B. Handle in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturer: UPNOVR, www.upnovr.com.

B. Acceptable Manufacturers
   1. Alaco Ladder Company, www.alacoladder.com.
   2. O'Keeffe's Inc, www.okeeffes.com.
   3. Precision Ladders Inc.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIXED ALUMINUM ACCESS LADDERS

A. Heavy Duty, Hatch Access Ladder:
   1. Model Number: U-200 by UPNOVR.
   2. Materials: ASTM B221, Alloy 6063, Temper T-6, non-spark extruded aluminum and ASTM B209, Alloy 6063 Temper T-6 sheet aluminum.
   3. Aluminum Finish: Mill finish.

4. Nominal Height: As indicated on the Drawings.
5. Side Rails: 1-3/4 inches (45 mm) wide by 3 inch (76 mm) tubes with 1/8 inch (3 mm) wall thickness.
6. Rungs: 1-1/4 inches (32 mm) wide by 1-1/4 inches (32 mm) tube with serrated surfaces and capable of 1,000 pound (455 kg) load. Space 12 inches (310 mm) on center. Attach rungs in centerline of side rails by welding.
7. Rung Length: 18 inches (457 mm).
8. Safety post extension: Post extension constructed of tubular aluminum sections with adjustable mounting brackets for attachment to top of ladder.
    a. Operation: Upward and downward movement controlled by manual operation Manaully locks when fully extended.

PART 3 EXECUTION

3.01 PREPARATION

A. Do not begin installation until substrates have been properly prepared. Notify Architect of unsatisfactory conditions before commencing work.

B. Field verify required dimensions. Coordinate with supporting construction to ensure adequate blocking and support.

C. Coordinate anchorages. Furnish setting drawings, templates and anchorage structural loads for fasteners resistance.

D. Isolate dissimilar metals to prevent electrolysis with bituminous paint or non-absorptive isolation pad to prevent contact.

3.02 INSTALLATION

A. Install ladders and accessories in accordance with manufacturer's instructions and approved submittals.

B. Securely anchor support brackets with fasteners of type and size recommended by manufacturer.

C. Place brackets at top and bottom and at 48 inches (1219 mm) maximum intermediate points.

D. Allow 7 inches (180 mm) minimum clearance from wall to center line of rungs.

E. Inspect ladder to verify proper and secure installation.

3.03 CLEANING

A. Clean ladders as recommended by manufacturer. Do not use abrasive agents, steel wool or chemicals.

END OF SECTION 05 51 50

SECTION 05 52 13
METAL PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stair railings.

B. Free-standing railings at steps.

C. Mezzanin railings and guardrails.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013.

E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).

G. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

H. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data including manufacturer's detailed technical product data installation instructions, dimension of each component, and profiles.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
   1. Include the design engineer's seal and signature on each sheet of shop drawings.

D. Samples: Submit two, 12 inch long samples of handrail. Submit two samples of elbow, wall bracket, and end stop.

E. Submit calculations, test data or certification that the railings will resist the load specified the Ohio Building Code.

1.05 QUALITY ASSURANCE

A. The work of this section shall be coordinated withe the work of other Sections.
   1. Verify the dimensions and work of other trades adjoining items of this Section before fabrication and installation.

B. Furnish to the pertinent trades items included under this section that are to built into the work of other sections.

C. Welding shall be performed by qualified welder and shall conform to the applicable AWS welding code.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation

B. Repair items which have become damaged to the satisfaction of the Architect prior to incorporating them into the work. Replace damaged items if repair cannot be done to the satisfaction of the Architect.

1.07 PROJECT SITE REQUIREMENTS

A. Field measurements shall be taken at the job site, prior to fabrication of items, to verify or supplement indicated dimensions and to ensure proper fitting of all items.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. 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 E 935.

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 E 935.

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.
   1. Top Rails: 1-1/2 inches diameter, round.
   2. Intermediate Rails: 1-1/2 inches diameter, round.
   3. Posts: 1-1/2 inches diameter, round.
      a. Surface mounted.

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. Base: Sized to fit the post specified .
   1. Heavy duty surface mount base.

H. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Plates: ASTM A36.

B. Steel Pipe: ASTM A 53/A 53M Type F or S Grade A material, black finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: No exposed bolts or screws.
   1. Diameter: 1 1/2 outside diameter, unless note otherwise.
   2. Post and top rails shall be continuous.

3. Spacing: Post shall not exceed 5'-0" on center and shall be uniformly spaced, unless noted otherwise.

E. Wire Mesh: 2" by 2", 0.185 gauge wire
   1. Weld Wire Mesh: Weldmesh, plain steel, balanced stubs with wire edge
   2. U-Edging: 1 inch, 18 gauge
   3. Manufacturer: McNichols Co, www.mcnichols.com
   4. Acceptable Manufacturers:
      a. Accurate Perforating; www.acurateperforating.com
      b. The Western Group, Salt Lake City, Utah; www.thewesterngroup.com
      c. Marco Specialty Steel, Houston Texas; www.marcospecialtysteel.com
      d. Direct Metals Company LLC, www.directmetals.com
      e. Substitutions: See Section 01 60 00 - Product Requirements.
   5. Location: As noted and shown on drawings.

F. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined steel.

G. Mounting: Brackets and flanges, with steel inserts for casting in concrete.

H. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

I. Straight Splice Connectors: Steel welding collars.

J. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

K. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

L. Paint: As indicated on drawings

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured.

D. Welded Joints:
   1. Welds shall be circumferential welds ground smooth and even to produce a railing that is neat in appearance and structurally sound. After fabrication, the welds and surrounding area shall be cleaned and buffed to blend withe adjacent finish.
   2. Rail to post connections shall be coped and fastened by continuous welds.
   3. Bends in the railing system shall be shown no distortion of the circular railing shape.

E. Provide anchors and plates required for connecting railings to structure.

F. Exposed Mechanical Fastenings: Provide flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

G. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

H. 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.

I. Interior Components: Continuously seal joined pieces by continuous welds.

J. 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.

K. Weld connections that cannot be shop welded due to size limitations.
   1. Weld in accordance with AWS D1.1/D1.1M.
   2. Match shop welding and bolting.
   3. Clean welds, bolted connections, and abraded areas.
   4. Touch up shop primer and factory-applied finishes.
   5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

L. Accurately form components to suit specific project conditions and for proper connection to building structure.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation

B. Ensure that adjacent surfaces, structures, and finishes are protected from damage by construction activities of this section.

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. Where railing is set in concrete, the post shall be placed in 2 1/2 inch diameter opening with non-shrink, nonmetallic grout. Post shall be placed with the centerline 4 inches form the edge of the concrete.

E. Anchor railings securely to structure.

F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

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 05 52 13

SECTION 05 52 20
ALUMINUM PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Aluminum pipe handrails.
      a. Provide concealed mechanical fasteners at connections and structural adhesive for splices.
      b. Fabricate railing system side mounting and embedded into concrete.
   2. Free Standing railings at steps

1.02 RELATED REQUIREMENTS

A. Section [03 30 00] - Cast-In-Place Concrete.

1.03 REFERENCES

A. American National Standard Specifications (ANSI)
   1. ANSI A1264.1 - Safety Requirements for Workplace Floor and Wall Openings, Stairs, and Railing Systems.

B. American Society for Testing and Materials: Standard Specifications (ASTM)
   1. ASTM B 429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
   2. ASTM E 935 - Standard Test Methods for Permanent Metal Railing Systems and Rails for Buildings.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Supply items required to be cast in to concrete or embedded in masonry with setting templates on instruction to appropriate sections.

1.05 ACTION SUBMITTALS

A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
   1. Details of material and construction.
   2. Storage and handling requirements and recommendations.
   3. Recommended installation requirements to properly accommodate the proposal railing and accessories.

B. Shop Drawings: Submit shop drawings for fabrication and installation of ornamental metal work. Include plans, elevations and detail sections. Indicate materials, methods, finishes and types of joinery, fasteners, anchorages and accessory items. Provide setting diagrams and templates for anchorages, sleeves, and bolts installed by others.

C. Samples: Submit rail sample of same alloy and thickness of the work.
   1. Selection Samples: Submit [color charts] [samples of materials] representing manufacturer's full range of available colors.
   2. Samples for Verification: Submit two (2) samples, minimum size 6 inches (15 cm) long of same alloy and thickness of the work, representing actual color and finish of products to be installed.

1.06 INFORMATIONAL SUBMITTALS

A. Load Tests: For railings required to meet structural loading requirements, submit results from ASTM E 935 conducted on the manufacturer=s supplied system indicating compliance with required structural loading.

B. Manufacturer's Material Safety Data Sheets (MSDS) for touch-up paint prior to their delivery to the site.

1.07 CLOSEOUT SUBMITTALS

A. Maintenance Instructions.

1.08 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of building authorities having jurisdiction in Project location and the following:
   1. Handrail Standard: ANSI A1264.1.
   2. Occupational Safety and Health Administration - 29 CFR 1910.23 - Guarding floor and wall openings.

B. Manufacturer's Qualifications: Minimum three (3) years documented experience producing systems specified in this section.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver railing systems and related components in protective packaging.
   1. Upon delivery open cartons and carefully inspect for damage.
   2. Contact manufacturer if there are questions or problems.
   3. Maintain material in original packaging until installation.

B. Store components to avoid damage from moisture, abrasion, and other construction activities.

1.10 SITE CONDITIONS

A. Field Measurements: Take measurements of actual dimensions where necessary for fit without gaps. Indicate measurements on shop drawings.

PART 2 PRODUCTS

2.01 MANUFACTURED PRODUCTS

A. Basis of Design Manufacturer: Superior Aluminum Products.
   1. Horizontal Pipe Rail Guard Railing - Series 5H

B. Other Approved Manufacturers
   1. Alumi-Guard: www.alumi-guard.com/#sle.
   2. Avcon Railing Systems: www.avcon.com/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configurations and heights.
   1. Top Rails: 1-1/2 inches diameter, round.
   2. Intermediate Rails: 1-1/2 inches diameter, round.
   3. Posts: 1-1/2 inches diameter, round.
      a. Surface mounted.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

E. Base: Sized to fit the post specified .

1. Heavy duty surface mount base.

2.03 ALUMINUM MATERIALS

A. Extruded Bars and Tubing: ASTM B221, Alloy 6063-T5/T2

B. Extruded Structural Pipe and Round Tubing: ASTM B429, Alloy 6063-T6

C. Plate and Sheet: ASTM B209, Alloy 6061-T6

D. Castings: ASTM B26, Alloy A356.0-T6

E. Aluminum Pipe: Schedule 40; ASTM B429/B429M, ASTM B241/B241M, or ASTM B483/B483M.

2.04 FABRICATION

A. Provide anchors and plates required for connecting railings to structure.

B. Exposed Mechanical Fastenings: Provide flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

C. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

D. Accurately form components to suit specific project conditions and for proper connection to building structure.

2.05 ALUMINUM FINISHES

A. Comply with AAMA 2603 for aluminum finishes required.

B. Color: To be selected by Architect from manufacturer's standard line.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 PREPARATION

3.03 INSTALLATION

A. Anchor railings securely to structure.

B. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

END OF SECTION 05 52 20

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rough opening framing for doors, windows, and roof openings.

B. Roofing nailers.

C. Preservative treated wood materials.

D. Miscellaneous framing and sheathing.

E. Communications and electrical room mounting boards.

F. Concealed wood blocking, nailers, and supports.

G. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finished Carpentry

B. Section 07 62 00 - Sheet Metal Flashing and Trim

C. Section 07 72 00 - Roof Accessories: Prefabricated roof curbs.

D. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2016.

B. AFPA WCD No.1 - Manual for Wood Frame Construction; American Forest and Paper Association; 2001.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. PS 1 - Structural Plywood; 2009.

F. PS 20 - American Softwood Lumber Standard; 2010.

G. SPIB (GR) - Grading Rules; 2014.

H. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2004, and supplements.

I. WWPA G-5 - Western Lumber Grading Rules; 2011.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

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.

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 moisture content less than 19 percent..

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. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

B. Other Applications:
1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
3. Other Locations: PS 1, C-D Plugged or better.

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.
2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
3. Anchors: Toggle bolt type for anchorage to hollow masonry.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

C. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

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 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.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Provide the following specific non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.

3.04 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. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. At long edges use sheathing clips where joints occur between roof framing members.
   2. Nail panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
   1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

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 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.07 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.

3.08 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 74 19 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 06 10 00

SECTION 07 08 08
BUILDING ENVELOPE COMMISSIONING

PART 1 - GENERAL

1.01 SUMMARY

A. The Owner has contracted separately with a Commissioning Authority independent from the Architect, Engineer, and Contractors. The Commissioning Authority shall be responsible solely to the Owner and shall act as an agent of the Owner in the quality control of the project. The Commissioning Authority shall, through the Owner, have the authority to direct the Contractors to perform corrective work until final acceptance of the project by the Owner.

B. The purpose of the commissioning is to verify for the Owner that building systems have been designed and installed to meet the Owner's Project Requirements and operate per the design intent. Commissioning does not eliminate or reduce the responsibility of the design team or contractors to provide a complete and functional facility but is rather to ensure an effective transition from the construction team to the Owner.

C. Specifications have been included to define contractors' responsibilities. It is expected that each contractor participates in the commissioning process, and it is the responsibility of each contractor to provide adequate personnel to do so.

1.02 RELATED DOCUMENTS

A. Section 01 91 13 – General Requirements - Commissioning

PART 2 - COMMISSIONING PROCESS

2.01 PRE-INSTALLATION MEETINGS

A. The Commissioning Authority shall be notified a minimum of 72 hours in advance for all building envelope pre-installation meetings. The commissioning authority may attend in person, participate via conference call, or review meeting minutes and provide comments regarding installation procedures to be followed

2.02 CONSTRUCTION INSPECTIONS

A. The Commissioning Authority will conduct periodic inspections of individual elements of the envelope construction throughout the construction period. The contractor shall coordinate with the Commissioning Authority to schedule envelope inspections as required to support the commissioning process.

2.03 CONTRACTOR TESTS

A. Contractor tests as required by other sections of the specification shall be scheduled and documented in accordance with the specifications. All testing shall be incorporated into the project schedule and the contractor shall provide the Commissioning Authority a minimum of 72 hours' notice prior to testing. The Commissioning Authority will witness selected tests at the sole discretion of the Commissioning Authority.

B. Thermal Imaging

1. The Commissioning Authority may conduct thermal imaging of the building envelope. The envelope will need to be complete, or nearly complete, and the building will need to be at least moderately conditioned. The Commissioning Authority will coordinate the timing and requirements of the thermal imaging with the Contractor based on seasonal weather and the construction schedule.

C. Water Spray Nozzle Testing

1. The Commissioning Authority may conduct water spray nozzle testing of various building assemblies. Building assemblies such as windows, storefronts, and louvers may be tested and shall be randomly selected by the commissioning agent.

2. Contractor shall provide personnel for testing, up to 8 hours. Depending on the construction schedule, testing may need to occur on multiple days. The cost for additional testing beyond the specified 8 hours due to water leakage and testing failures shall be the responsibility of the contractor.

3. Testing shall be completed using a 3/4" hose fitted with a type B-25 brass nozzle and a constant 30-35 psi pressure. Spray nozzle shall be held approximately 1-2 feet away from building assembly and moved slowly back and forth for minimum of five minutes.

4. Contractor shall be responsible for providing a 3/4" hose and water supply. Commissioning Authority will provide the spray nozzle assembly

2.04 MASTER ISSUES LOG

A. Deficiencies noted during the commissioning process shall be documented in the Master Issues Log.

B. Contractors will be responsible for correcting deficiencies and providing written responses to the Commissioning Authority describing the date and method of resolution. If the deficiency was not corrected, the contractor shall provide an explanation as to why it was not corrected.

C. Participation in the in the commissioning process is the contractors' responsibility. Unresolved issues or a failure to provide responses to the Master Issues Log may be considered during the pay application approval process.

D. Status will be tracked for each deficiency and the Master Issues Log will be updated accordingly.

E. The Commissioning Authority will perform limited rechecks of discrepancies after written notification has been received from the contractor that corrections are complete. The cost of subsequent rechecks, if necessary, will be charged directly to the contractor at the hourly rate of the Commissioning Authority.

PART 3 - EXECUTION

3.01 RESPONSIBILITIES OF BUILDING ENVELOPE INSTALLER

A. The Contractor shall provide the Commissioning Authority assistance as necessary to gain access to the construction site for the purpose of verifying that the installation of materials and equipment is performed in accordance with the contract documents. This shall include the use of keys, ladders, power lifts and other specialized equipment where necessary.

B. Participate in commissioning specific meetings scheduled by the Commissioning Authority or Construction Manager.

C. Assist the Commissioning Authority as necessary, including responding to all building envelope reports and issues logs.

D. Provide owner training per the project specifications.

END OF SECTION

SECTION 07 21 13
BOARD INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at foundation perimeter, under floor slabs, and inside masonry cavity walls.

B. Integral air and vapor barrier wall system with board insulation, foamed in place insulation, adhesive, flashing, and tape.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete

B. Section 04 20 00 - Unit Masonry

C. Section 05 41 00 - Structural Metal Stud Framing: Board insulation as wall sheathing.

D. Section 07 21 19 - Foamed-In-Place Insulation: Plastic foam insulation other than boards.

1.03 REFERENCE STANDARDS

A. ASTM C203 - Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation; 2005a (Reapproved 2012).

B. ASTM C209 - Standard Test Methods for Cellulosic Fiber Insulating Board; 2012.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

F. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.

G. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016 (Reapproved 2023).

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

J. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

L. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

B. Insulation inside masonry cavity walls: Extruded polystyrene (XPS) board

C. Insulation Over Metal Stud Framed Walls, Continuous: Glass fiber Poly-Iso board board.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
   1. Application: Perimeter foundation insulation below slab.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
   5. Board Size: 24 x 96 inch.
   6. Board Thickness: As indicated on drawings
   7. Board Edges: Square.
   8. Thermal Resistance: R-value of 5.0 per 1 inch at 75 degrees F mean temperature.
   9. Compressive Resistance: 25 psi.
   10. Water Absorption, Maximum: 0.3 percent, by volume.
   11. Manufacturers:
      a. DuPont: Styrofoam Brand Square Edge XPS; www.dupont.com.
      b. Kingspan Insulation LLC: GreenGuard XPS Type IV, 25 psi; www.kingspan.com.
      c. Owens Corning Corporation: FOAMULAR 250 Extruded Polystyrene (XPS) Insulation; www.ocbuildingspec.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Extruded Polystyrene (XPS) Continuous Insulation Board
   1. Application: Masonry cavity wall insulation.
   2. Extruded-Polystyrene Board Insulation: ASTM C 578
      a. Compressive resistance 25 psi (ASTM D1621)
      b. Thermal resistance: R-value of 5.0 per inch at 75 °F (ASTM C518).
      c. Water absorption: Max. 0.1% by volume (ASTM C272).
      d. Surface Burning Characteristics (ASTM E84)
         1) Flame spread: less than 25
         2) Smoke Developed: less than 450.
      e. Panel dimensions:
         1) Board thickness: 2 1/2”
         2) Board size: 15 3/4" x 96" square edge.
   3. Cavity Wall Insulation System Options: Provide one of the following
      a. Option 1: DuPont Styrofoam Brand Cavitymate Ultra Wall System with foam insulation joints and penetration filler as noted below in accessories
         1) 3-in-1 continuous thermal, air and water barrier system
      b. Option 2: XPS Continuous Insulation Board with Fluid Applied Air Barrier
         1) Reference section 07 27 26 Fluid Applied Membrane Air Barrier for product requirements.

2) Manufacturers:
(a) Kingspan: Greenguard Type IV XPS Insulation Board; www.kingspan.com
(b) Owens Corning: Foamular CW25; www.owenscorning.com

C. Polyisocyanurate Insulation
1. Continuous Exterior Insulation: Glass-fiber-reinforced enhanced polyisocyanurate foam core faced with nominal 4 mil embossed acrylic-coated aluminum on the exterior side, complying with ASTM C1289 and meeting the following physical properties:
a. ASTM C1289, Type 1, Class 2, Grade 3.
b. Compressive Strength (ASTM D1621): 25 psi, minimum.
c. Long-Term Thermal Resistance (ASTM C518): measured at Mean Temp of 75 F: R-6.5 at 1 inch, R-15.0 minimum at 2.5 inches.
d. Flexural Strength (ASTM C203): Minimum 40 psi.
e. Water Absorption (ASTM C209): Minimum 0.1 percent by volume.
f. Water Vapor Permeance (ASTM E96/E96M): <0.03 perms.
g. Maximum Use Temperature: 250 degrees F.
h. Class A, less than and/or equal to 25 Flame spread Index and less than 450 Smoke Developed Index, classified at Max. thickness per ASTM E84 criteria.
2. Application: Metal Stud walls with ACM panel
3. Manufacturers
a. Atlas; EnergyShield Pro: www.atlasrwi.com.
b. DuPont; Thermax XARMOR (ci) Exterior Insulation: www.dupont.com.
c. Ox Engineered Products; ISO RED MAX HD: www.oxengineeredproducts.com.
d. Rmax;ECOMAXci FR Air Barrier: www.rmax.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

A. Provide all accessories that are approved per manufacturers installation instructions.

B. Adhesive: Provide insulation manufacturer's recommended adhesive.
1. Product: The Dow Chemical Company GREAT STUFF PRO™ Gaps & Cracks single component insulating foam sealant where necessary

C. Joint Sealants
1. LiquidArmor LT(low temp application)
a. Fluid Applied with Trowel
b. Installed during low temperature applications
c. Used to create seamless barriers at rough openings of windows and doors as well as insulation joints.
d. Can be used in temps as low as -20 degrees F
e. Will withstand rain within 15 minutes of installation, however do not apply over wet surfaces.
f. Complies with ASTM E331 and ASTM E2357.
g. Shall be applied per manufacturers' recommendations and instructions
2. LiquidArmor CM - (warm spray application)
a. Can be sprayed between 40 degrees and 120 degrees F
b. Read and follow all manufacturers's instructions
c. Spray with a max of 3,300 PSI
d. Apply minimum of four inches wide
e. Apply at a minimum of 50 wet mills

D. Penetration Filler: Provide insulated sheathing manufacturer's recommended polyurethane foam for sealing penetrations of insulated sheathing.

1. Products:
    a. The Dow Chemical Company “GREAT STUFF PRO™ Gaps & Cracks” single component polyurethane insulating foam sealant.
    b. The Dow Chemical Company “GREAT STUFF PRO™ Window & Door” single component polyurethane low-pressure foam sealant.

E. Gap Air Infiltration Filler: Two Component, Quick Cure Polyurethane Foam
1. NFPA 286 Approval for Exposed use to the interior of the building without the need for a 15-min thermal barrier.
2. ASTM E-84 Class A
3. Product: The Dow Chemical Company FROTH-PAK™ Foam Insulation two component, quick-cure polyurethane foam

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. Apply adhesive to back of boards:
1. Three continuous beads per board length.

B. Install boards vertically on foundation perimeter.
1. Place boards to maximize adhesive contact.
2. Butt edges and ends tightly to adjacent boards and to protrusions.

C. Extend boards over expansion joints, unbonded to foundation on one side of joint.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION BEHIND METAL PANEL

A. Apply adhesive to back of boards:
1. Three continuous beads per board length.

B. Install boards horizontally on walls.
1. Place boards to maximize adhesive contact.
2. Install in running bond pattern.
3. Butt edges and ends tightly to adjacent boards and to protrusions.
    a. Place a continuous bead of adhesive between boards

C. Extend boards over expansion joints, unbonded to wall on one side of joint.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

E. Place 6 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.

F. Liquid flashing insulation board joints and protrusion or interruptions to the insulation plane
1. Ensure insulation board surfaces are clean, free of dust and dry prior to applying.
2. Apply liquid flashing over exposed board joints using a squeegee or bristle brush. Ensure liquid flashing adheres to embossed surface.

3.04 BOARD INSTALLATION AT CAVITY WALLS

A. Install in accordance to manufacturer's recommendations

B. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Foam seal joints between sheets.
   2. Extend sheet full height of joint.

C. Apply foam adhesive to back of boards:
   1. Three continuous beads per board length.

D. Install boards to fit snugly between wall ties.
   1. Place membrane surface against foam adhesive.

E. Install boards vertically on walls.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.
      a. Place a continuous bead of adhesive between boards

F. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

G. Foam seal insulation board joints and protrusions or interruptions to the insulation plane to maintain continuity of air barrier.

H. Joint Sealant: For joints, gaps, and openings less that ½ inch (13 mm) wide, install continuous bead of joint sealant. Provide backer rod as required to prohibit joint sealant from bonding to a third surface.

I. Expanding Foam Sealant: For joints, gaps, and openings greater than ½ inch (13 mm) wide, install sealant in a continuous ribbon between adjacent board edges, working sealant in to joint for a full depth bead of sealant.

J. Place 6 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.

3.05 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.

3.06 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07 21 13

SECTION 07 21 16
BLANKET INSULATION

PART 1GENERAL

1.01 SUMMARY OF WORK

A. Section includes acoustic batt insulation.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry

B. Section 07 92 00 - Joint Sealants

1.03 REFERENCE STANDARDS

A. ASTM C167 - Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations; 2018 Edition.

B. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2009a.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

J. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

K. ASTM E413 - Classification for Rating Sound Insulation; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays.

1.05 SUBMITTALS

A. See Section 01 30 00-Administrative Requirements, for submittal procedures.

B. Product Data: Submit product data including manufacturer's literature for insulation materials and accessories, indicating compliance with specified requirements and material characteristics.

PART 2PRODUCTS

2.01 MANUFACTURERS

A. At Contractor's option, provide either glass fiber or mineral fiber thermal or acoustic batt insulation where acoustic batt insulation is indicated.

B. Mineral Wool Sound Attenuation Insulation:
   1. RockWool; Safe n Sound.
   2. Johns Manville; MinWool SAFB
   3. Owens Corning Fiberglass Corporation; Thermafiber SAFB
   4. Substitutions: See Section 01 60 00 - Product Requirements.

C. Fiberglass Sound Attenuation Insulation:
   1. CertainTeed/Saint Gobain; Noise Reducer Sound Attenuation Batts; www.certainteed.com
   2. Johns Manville: Cavity-SHIELD Fiberglass Insulation; www.johnsmanville.com
   3. Owens Corning Fiberglass Corporation; Sound Attenuation Batt Insulation (SAB) Fiberglass Insulation; www.owenscorning.com
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DESCRIPTION

A. Non-combustible, lightweight, semi-rigid mineral fiber batt insulation to, ASTM C665, Type 1, that provides fire resistance to ASTM E136 and sound control to ASTM C423.

2.03 INSULATION TYPES AND PERFORMANCE CRITERIA

A. Acoustical and fire batt insulation for walls and floors to ASTM C665, Type 1.
   1. Fire performance:
      a. Non-combustibility: To ASTM E136 .
      b. Surface Burning Characteristics: To ASTM E84.
         1) Flame spread: 0.
         2) Smoke developed: 0.
      c. Acoustical Performance:
         1) Airborne sound transmission loss: To ASTM E90.
         2) Rating sound insulation: To ASTM E413.
         3) Sound absorption coefficients: To ASTM C423 .
      d. Thermal resistance: To ASTM C518.
      e. Corrosive resistance: To ASTM C665, Corrosive to steel - Pass.
      f. Stainless steel stress corrosion: To ASTM C795.
      g. Density: To ASTM C612 , 2.5 lb/ft3.
      h. Recycled Content: 16 percent minimum

2.04 MATERIALS

A. Non-combustible, lightweight, mineral fiber batt insulation to ASTM C665, Type 1, that provides fire resistance to ASTM E136 and a sound control to ASTM E90 and ASTM C423 .
   1. Size: 16 x 48 inches, or size to fit in designed wall as shown on drawings.
   2. Thickness: Thickness as shown on drawings, fill entire stud cavity

2.05 ACCESSORIES

A. Mechanical fasteners in accordance with insulation manufacturer's written recommendations.

B. Acoustical sealant in accordance.

C. Firestopping materials.

2.06 SOURCE QUALITY CONTROL

A. Ensure insulation components and accessories are supplied or approved in writing by single manufacturer.

PART 3EXECUTION

3.01 INSTALLERS

A. Use only installers with minimum of 5 years experience with the work similar to work of this section.

3.02 EXAMINATION

A. Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for insulation installation in accordance with manufacturer's written recommendations.
   1. Visually inspect substrate in presence of Consultant.
   2. Ensure surfaces are free of snow, ice, frost, grease and other deleterious materials.
   3. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.
   4. Start of insulation installation indicates installer's acceptance of substrate installation conditions.

3.03 INSTALLATION

A. Install insulation in accordance with manufacturer's written recommendations and guidelines.

B. Install insulation to maintain continuity of thermal protection to building elements and spaces.

C. Do not compress insulation to fit into spaces.

D. Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

E. Keep insulation minimum 3 inches from heat emitting devices such as recessed light fixtures, and minimum 2 inches from sidewalls of chimneys and vents.

F. Seal joints with acoustical joint sealant.

G. Do not enclose insulation until before inspection and receipt of Consultant's written approval.

3.04 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with Section 01 43 00 - Quality Assurance.

3.05 CLEANING

A. Progress Cleaning: Perform cleanup as work progresses.
   1. Leave work area clean at end of each day.

B. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.

3.06 PROTECTION

A. Store the material to protect against weathering and physical damage, including humidity.

B. Protect installed products and accessories from damage during construction.

C. Repair damage to adjacent materials caused by insulation installation.

END OF SECTION 07 21 16

SECTION 07 21 19
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in-place insulation at junctions of dissimilar wall and roof materials to achieve a thermal and air sealwith protective overcoat.

B. Protective intumescent coating.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

E. FM 4880 - Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials; 2022.

F. NFPA 275 - Standard Method of Fire Tests for the Evaluation of Thermal Barriers; 2022.

G. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

H. UL 1040 - Standard for Safety Fire Test of Insulated Wall Construction; Current Edition, Including All Revisions.

I. UL 1715 - Standard for Safety Fire Test of Interior Finish Material; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

A. See Section 01 30 00 - 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.

1.06 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.

1.07 PROJECT CONDITIONS

A. Sequence work to ensure timely placement of insulation within concealed spaces.

1.08 FIELD CONDITIONS

A. Do not install insulation when ambient temperature is lower than 60 degrees F.

B. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

PART 2 PRODUCTS

2.01 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, open cell or 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 fire protection requirements.
      a. Fire Protection: Provide 15-minute thermal barrier of 1/2 inch gypsum board or equivalent material complying with NFPA 275 test method, or foamed-in-place insulation either exposed or with covering that complies with FM 4880, NFPA 286, UL 1040, or UL 1715.
   2. Insulation: ASTM C 1029, Type I, polyurethane, 15 psi, minimum.
   3. Thermal Resistance: R-value of 7.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
   4. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
   5. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
   6. Air Permeance: 0.04 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
   7. Closed Cell Content: At least 90 percent.
   8. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   9. Products:
      a. Carlisle Spray Foam Insulation; SealTite PRO: www.carlisle.com.
      b. Demilec LLC; HEATLOK HFO High Lift: www.demilec.com
      c. Enverge; OnePass HFO: www.envergesprayfoam.com.
      d. Huntsman Building Solutions; Heatlok HFO High Lift: www.huntsmanbuildingsolutions.com.
      e. Johns Manville; JM Corbond IV: www.jm.com
      f. NCFI Polyurethanes; InsulBloc HFO 11-037: www.ncfi.com.
      g. Preferred Solutions, Inc; Staycell 504 Closed Cell Spray Foam Insulation: www.preferredsolutions.net.
      h. SWD Urethane; Quik-Shield Goblin: www.swdurethane.com.
      i. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Protective Coating: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes.
   1. Coating Type: Single component, water-based.

2. Protected Insulation Type: Spray polyurethane foam (SPF).
3. Application: Apply using brush, roller, or airless sprayer.
4. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
5. Color: As indicated on drawings.
6. Products:
   a. TPR2; FIRESHELL F10E: www.tpr2.com.
   b. International Fireproof Technology Inc; DC315 Intumescent Coating: www.painttoprotect.com/.
   c. No-Burn, Inc; Plus ThB Intumescent Coating: www.noburn.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete before insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation 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 achieve a thermal resistance R-value of 19 minimum.

D. Apply protective coating monolithically, without voids, to fully cover foam insulation, to achieve fire rating required.

E. Patch damaged areas.

F. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

G. Trim excess away for applied trim or sheet metal closer trim.

3.04 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION 07 21 19

SECTION 07 22 16
ROOF BOARD INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Polyiso board insulation, flat and tapered.

B. Vapor retarder.

C. Accessories.

1.02 RELATED SECTIONS

A. Section 05 31 00 - Steel Decking

B. Section 06 10 00 - Rough Carpentry: Wood nailers, curbs, and cant strips.

C. Section 07 54 19 - PVC Thermoplastic Roofing

D. Section 07 72 00 - Roof Accessories: Integral curbs for roof hatches.

1.03 REFERENCE STANDARDS

A. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation; 2021.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for insulation, vapor retarder, fasteners, and adhesive.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, and mechanical fastener layout.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.

B. Fire-Test-Response Characteristics
   1. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

B. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in

addition to and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING PROCEDURES

A. Deliver materials in original unopened packaging.

B. Containers labeled with manufacturer's name, brand name, and identification of various items.

C. Store materials in a dry area and protect from inclement weather. Damaged materials shall be replaced at contractor's expense.

D. Do not allow roofing membrane to come in contact or be exposed to any materials that would be detrimental to or cause degradation of the roofing membrane.

PART 2 PRODUCTS

2.01 INSULATION

A. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289, Type II, Class 1, Grade 2 with the following characteristics:
   1. Compressive Strength: 20 psi.
   2. Facing: Glass fiber reinforced cellulosic facers both faces.
   3. Board Size: 48 x 96 inch.
   4. Board Thickness: 2 Layers of 2.6 Inches
   5. Long-Term Thermal Resistance (LTTR): R-value of 5.7 per inch.
   6. Board Edges: Square.
   7. Insulation must be compatible with roof membrane.
   8. Manufacturers:
      a. Atlas Roofing Corporation; ACFoam-II: www.atlasroofing.com.
      b. Carlisle Syntec; InsulBase: www.carlislesyntec.com.
      c. Duro-Last; Duro-Guard ISO II: www.duro-last.com.
      d. Elevate; ISOGARD GL: www.holcimelevate.com.
      e. GAF Materials Corporation; EnergyGuard: www.gaf.com.
      f. Hunter Panels; H-Shield: www.hpanels.com.
      g. Johns Manville; ENRGY3: www.jm.com.
      h. Substitutions: See Section 01 60 00 - Product Requirements.

B. Tapered Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289, Type II, Class 1, cellulose felt or glass fiber mat both faces; Grade 2 and with the following characteristics:
   1. Compressive Strength: 20 psi
   2. Facing: Glass fiber reinforced cellulosic facers both faces.
   3. Board Size: 48 x 96 inch.
   4. First layer; Board Thickness: 2 inch.
   5. Second layer; Tapered Board: Slope 1/4 inch per foot; minimum thickness 1/2 in; fabricate of fewest layers possible.
   6. Long-Term Thermal Resistance (LTTR): R-value of 5.7 per inch thickness.
   7. Board Edges: Square.
   8. Insulation must be compatible with roof membrane.
   9. Manufacturers:
      a. Atlas Roofing Corporation; Tapered ACFoam-II: www.atlasroofing.com.
      b. Carlisle Syntec; InsulBase: www.carlislesyntec.com
      c. Duro-Last; Duro-Guard ISO II: www.duro-last.com.
      d. Elevate; ISOGARD GL: www.holcimelevate.com.
      e. GAF Materials Corporation; EnergyGuard Tapered: www.gaf.com.

f. Hunter Panels; Tapered H-Shield: www.hpanels.com.
g. Johns Manville; Tapered ENRGY3: www.jm.com.
h. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 VAPOR RETARDER:

A. ASTM C1136

B. Maximum permeance rating of 0.13 perm.

C. Manufacturers:
1. Griffolyn Type-65; Reef Industries, Houston, Texas
2. DURA-SKRIM 6WW; Raven Industries, Sioux Falls, South Dakota
3. WMP-VR; Lamtec Corporation, Mount Bethel, Pennsylvania
4. Or as recomended by roofing membrane manufacturer

2.03 ACCESSORIES

A. Adhesive: As approved by roof board insulation manufacturer.

B. Fasteners: As approved by roof board insulation manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect all surfaces to receive roofing for any condition that will adversely affect execution, performance, or quality of work.

B. Verify that surfaces and site conditions are ready to receive work.

C. Verify deck is supported and secure.

D. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

E. Verify deck surfaces are dry and free of snow or ice.

F. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

G. All roof surfaces and all sloped surfaces to drains and outlets shall be checked and approved by the roofing contractor prior to the start of the roofing work.

H. Install roofing material only under satisfactory conditions as specified by the membrane manufacturer.

3.02 GENERAL REQUIREMENTS

A. Do not lay out or expose any insulation on the deck that cannot be covered by membrane on the same day.

B. In making all field heat welds, make sure all edges are clean and free of tar, mastic or other foreign items.

C. Do not expose membrane and accessories to a constant temperature in excess of 110 degrees Fahrenheit.

D. Sealants and adhesives should be applied according to the manufacturer's specifications and all containers shall be disposed of properly.

E. Start securing the membrane at the highest point and work towards the drains.

F. Weather precautions: Proceed with roofing work when existing and forecasted weather conditions permit work performance in compliance with manufacturer's recommendations.

G. Roofing system shall not be applied when the surrounding air, surface temperature, relative humidity or wind velocity is not within the range acceptable under the manufacturer's recommendations.

H. Prior to starting work, protect all work in an approved manner including all paving and faces of building walls. Provide special protection of the face of the building wall adjacent to hoist.

3.03 METAL DECK PREPARATION

A. Install preformed sound absorbing glass fiber insulation strips supplied by Section 05 31 00 in acoustic deck flutes. Install in accordance with manufacturer's instructions.

3.04 VAPOR RETARDER INSTALLATION

A. At acoustical metal deck, install acoustical insulation in roof deck flutes first.

B. Loosely lay vapor retarder over entire roof area extending to roof edges and to adjacent walls.

C. Side and end laps of each sheet a minimum of 6 inches.

D. Seal laps at seams with continuous strip of tape recommended by the vapor retarder manufacturer. Seal at penetrations and at roof edges with manufacturer recommended butyl tape or sealant.

E. Vapor retarder shall be positively sealed at all edges, penetrations and wall utilizing manufacturer vapor retarder accessories.

F. Seal at penetrations and at roof edges with manufacturer recommended butyl tape or sealant.

3.05 INSULATION BOARD INSTALLATION

A. Attach insulation in accordance with insulation manufactuerer's instructions.
   1. Mechanically attach first layer of insulation to deck.
   2. Fully adhere subsequent layers of insulation to first layer.

B. On metal deck, place boards perpendicular to flutes with insulation board edges bearing on deck flutes.

C. The ends of the insulation boards shall be staggered 50% from row to row.

D. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

E. Lay subsequent layers of insulation with joints staggered minimum 12 inch from joints of preceding layer.

F. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

G. Do not apply more insulation than can be covered with membrane in same day.

3.06 CLEAN-UP

A. Upon completion of installation, the contractor shall remove all foreign matter, rubbish and scrap material from the roof.

B. Repair or replace defaced or damaged finishes caused by work of this section.

3.07 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for general requirements for field quality control and inspection.

B. Inspection: Roofing manufacturer's technical representative and roofing contractor shall conduct all required inspections. Submit all required drawings, details, and completed questionnaires to the roofing manufacturer before obtaining the specified warranty. After an authorized Technical Representative has inspected the roof for determining acceptability for

warranty issuance, any deficiencies on the final inspection report shall be corrected by the contractor/applicator and made ready for reinspection within five (5) working days.

C. Warranty: Upon receipt of required materials, certifying inspection, and acceptance of the roofing system by the roofing manufacturer, the warranty shall be duly executed and issued to the Owner. Date of Warranty will be the date of Substantial Completion.

3.08 PROTECTION OF FINISHED WORK

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION 07 22 16

SECTION 07 27 26
FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials and installation methods for fluid applied, vapor permeable air barrier membrane system located in the non-accessible part of the wall.

B. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.

1.02 RELATED SECTIONS

A. Section 03 3000 - Cast in Place Concrete

B. Section 04 2000 – Unit Masonry

C. Section 06 1000 - Rough Carpentry

D. Section 07 6200 - Sheet Metal Roofing

E. Section 07 6200 – Sheet Metal Flashing and Trim

F. Section 07 9005 – Joint Sealers

1.03 DEFINITIONS

A. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.04 PERFORMANCE REQUIREMENTS

A. Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration.

B. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

C. This Project to be ABAA certified and will require ABAA inspections and testing.

D. Contractor to be ABAA (Air Barrier Association of America) Certified

1.05 REFERENCES

A. ASTM C920 - Specifications for Elastomeric Joint Sealants

B. ASTM C1193 - Guide for Use of Joint Sealants

C. ASTM D412 - Standard Test Methods for Rubber Properties in Tension

D. ASTM D570 - Test Method for Water Absorption of Plastics

E. ASTM D1004 - Test Method for Initial Tear Resistance of Plastic Film and Sheeting

F. ASTM D1876 - Test Method for Peel Resistance of Adhesives

G. ASTM D1938 - Test Method for Tear Propagation Resistance of Plastic Film and Sheeting

H. ASTM D1970 -Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection

I. ASTM D4258 - Practice for Surface Cleaning Concrete for Coating

J. ASTM D4263 - Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

K. ASTM E96 - Test Methods for Water Vapor Transmission of Materials

L. ASTM E154 - Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

M. ASTM E162 - Test Method for Surface Flammability of Materials Using a Radiant Heat Source

N. ASTM E1186 - Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems

O. ASTM E2178-01 - Standard Test Method for Air Permeance of Building Materials

P. ASTM E2357 -Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

1.06 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   1. Include details of interfaces with other materials that form part of air barrier.
   2. Include details of mockups.

C. Samples: Submit representative samples of the following for approval:
   1. Fluid applied membrane
   2. Transition Membrane
   3. Through Wall Flashing

D. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

E. Qualification Data: ABAA Contractor Certification

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.

G. Test Certification: ABAA inspection and test results

H. Warranty: Submit a sample warranty identifying the terms and conditions.

1.07 QUALITY ASSURANCE

A. Manufacturer: Air barrier systems shall be manufactured by a firm with a minimum of 20 years experience in the production of air barriers.
   1. Source Limitations: Obtain primary air-barrier material and through wall flashing through one source from a single manufacturer.
   2. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

1.08 MOCKUP

A. Mockups: Before beginning installation of air barrier, provide air barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
   1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.

2. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

B. See Section 04 2000 Unit Masonry for additional requirements.

1.09 PRE-INSTALLATION MEETING

A. A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Preinstallation conference shall include the Contractor, installer, Architect, and system manufacturer's field representative. Agenda for meeting shall include but not be limited to the following:
   1. Review of submittals.
   2. Review of surface preparation, minimum curing period and installation procedures.
   3. Review of special details and flashings.
   4. Sequence of construction, responsibilities and schedule for subsequent operations.
   5. Review of mock-up requirements.
   6. Review of inspection, testing, protection and repair procedures.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets.

B. Protect from damage from sunlight, weather, excessive temperatures and construction operations.

C. Remove damaged material from the site and dispose of in accordance with applicable regulations.

D. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.

E. Protect fluid-applied membrane components from freezing and extreme heat.

F. Sequence deliveries to avoid delays, but minimize on-site storage.

1.11 PROJECT CONDITIONS

A. Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer.

B. Protect substrates from environmental conditions that affect performance of air barrier.

C. Do not apply air barrier to a wet substrate or during snow, rain, fog, or mist.

1.12 WARRANTY

A. Material Warranty: Manufacturer's standard form in which manufacturer agrees to replace fluid-applied air barrier membrane materials, that fail within specified warranty period when installed and used in strict conformance with written manufacturer's instructions.
   1. Failures include, but are not limited to, the following:
      a. Failure to maintain air permeance rating not to exceed .004 cfm/sq. ft (0.02 L/s/sq. m.) when tested per ASTM E2178, within specified warranty period.
      b. Failure to maintain a vapor permeance rating greater than 10 perms when tested in accordance with ASTM E96, Method B.
      c. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Grace Construction Products: www.na.graceconstruction.com.

1. Product: Single Component Acrylic Membrane Vapor-Permeable Membrane Air Barrier

B. Acceptable Manufacturers:
   1. Henry Company: www.henry.com.
   2. PROSOCO: www.prosoco.com.
   3. Tremco Global Sealants: www.tremcosealants.com.
   4. BASF, Enershield HP: www.wallsystems.basf.com
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FLUID-APPLIED, VAPOR PERMEABLE MEMBRANE AIR BARRIER

A. Physical and Performance Properties: Provide products with the following minimum properties:
   1. Membrane Air Permeance: Not to exceed 0.0004 cfm/sq. ft. of surface area (at specified thickness) at 1.57-lbf/sq. ft. pressure difference (0.002 L/s x sq. m of surface area at 75-Pa) when applied to CMU wall; when tested per ASTM E2178.
   2. Membrane Vapor Permeance: Not less than 11.2 perms (649.6 ng/Pa x s x sq. m); when tested per ASTM E96.
   3. Assembly Performance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.0008 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 pounds per square foot) (0.004 L/s x sq. m of surface area at 75-Pa) when tested in accordance with ASTM E 2357.
   4. UV Exposure Limit: Not more than 180 calendar days; per ASTM D412 and ASTM E96-Method B.

2.03 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane.

B. Liquid Membrane for Details and Terminations: Provide Bituthene Liquid Membrane.

C. Wall Primer (for Use with Throughwall Flashing and Tapes Applied to Substrate): Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.
   1. Flash Point: No flash to boiling point
   2. Solvent Type: Water
   3. VOC Content: Not to exceed 10 g/l
   4. Application Temperature: -4°C (25°F) and above
   5. Freezing point (as packaged): -7°C (21°F)
   6. Product: Perm-A-Barrier WB Primer manufactured by Grace Construction Products.

D. Flexible Membrane Wall Flashing: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
   1. Water Vapor Transmission: ASTM E96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
   2. Water Absorption: ASTM D570: max. 0.1% by weight
   3. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.
   4. Tear Resistance
      a. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.
      b. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.
      c. Lap Adhesion at -4°C (25°F): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
      d. Low Temperature Flexibility ASTM D1970: Unaffected to -43°C (-45°F)
      e. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)
      f. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%.

g. Product: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products.

E. Joint Reinforcing Strip: Air barrier manufacturer's approved tape.

F. Transition Membrane: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
   1. Water Vapor Transmission: ASTM E96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
   2. Water Absorption: ASTM D570: max. 0.1% by weight
   3. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.
   4. Tear Resistance
      a. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.
      b. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.
      c. Lap Adhesion at -4°C (25°F): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
      d. Low Temperature Flexibility ASTM D1970: Unaffected to -43°C (-45°F)
      e. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)
      f. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%.
      g. Product: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products.

G. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
   1. Product: Bituthene Liquid Membrane, manufactured by Grace Construction Products.

H. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft (24 to 32 kg/cu. m) density; flame spread index of 25 or less according to ASTM E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

I. Joint Sealant: ASTM C920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
   1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
   2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
   3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
   4. Verify that masonry joints are struck flush and completely filled with mortar.
   5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Refer to manufacturer's literature for requirements for preparation of substrates.

B. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier system.

C. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with 50 - 75mm (2-3 in.) wide, manufacturer's recommended self-adhesive tape. Gaps greater than 6mm (1/4 in.) should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the tape and fluid applied air barrier system.

D. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth trowel-cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.

E. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

F. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

G. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

H. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

I. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

J. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

K. At changes in substrate plane, apply sealant or Bituthene Liquid Membrane at sharp corners and edges to form a smooth transition from one plane to another.

L. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D4258 before coating surfaces.
   1. Prime substrate as required.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C1193 and with air barrier manufacturer's written instructions. Apply tape to joint prior to installing fluid air barrier membrane.

3.04 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.
   1. Vapor-Permeable Membrane Air Barrier: 90-mil (2.4-mm) wet film thickness, 45-mil (1.2-mm) dry film thickness.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.05 TRANSITION MEMBRANE INSTALLATION

A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
   1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
   2. Install strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.
   3. Install all flashings only after application of air barrier.

B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Reprime areas exposed for more than 24 hours.
   1. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.
   1. Transition Membrane: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.06 FIELD QUALITY CONTROL

A. Project to be ABAA certified and will require ABAA inspections and testing. Cost of testing to be by contractor.

B. Inspections: Air barrier materials and installation shall be inspected for compliance with requirements. Inspections may include the following:
   1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Continuous structural support of air barrier system has been provided.
   3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
   4. Site conditions for application temperature and dryness of substrates have been maintained.
   5. Maximum exposure time of materials to UV deterioration has not been exceeded.

6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Remove and replace deficient air barrier components and retest as specified above.

3.07 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 150 days.

C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Remove masking materials after installation.

END OF SECTION 07 27 26

SECTION 07 54 19
PVC THERMOPLASTIC SINGLE-PLY ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fully Adhered system with PVC thermoplastic roofing membrane.

B. Roofing accessories: stack boots, roofing expansion joints, and walkway pads.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements

B. Section 05 31 00 - Steel Decking: Acoustical deck flute insulation.

C. Section 07 22 16 - Roof Board Insulation

D. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings.

E. Section 07 71 00 - Roof Specialties

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 D4434/D4434M - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing; 2021.

C. NRCA (RM) - The NRCA Roofing Manual; 2017.

D. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's written information listed below.
   1. Product data indicating membrane materials, flashing materials, fasteners, and adhesive.
   2. Preparation instructions and recommendations.

C. Samples for Selection: Submit two samples 12 by 12 inches in size illustrating colored coating.

D. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.

E. Warranty:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's certification that installation complies with all warranty conditions for the waterproof membrane.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty (20) years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section:
   1. Approved by membrane manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Protect products in weather protected environment, clear of ground and moisture.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within 20 years after installation.

C. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind with wind speeds up to 55 mph or other natural causes.
   1. Warranty Term: 20 years.
   2. For repair and replacement include costs of both material and labor in warranty.

D. Roofing Contractor Warranty: Contractor shall guarantee for 2 years, from the date of substantial completion, at their cost to make necessary repairs to the roof system resulting from faults or defects caused due to workmanship. Guarantee shall include but is not limited to the following: roof membrane, flashings, insulation, fasteners, walkways, expansion joints, pipe flashings and boots.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carlisle SynTec

B. Duro-Last Roofing, Inc

C. Sarnafil, Inc

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROOFING APPLICATIONS

A. PVC Membrane Roofing: Single-ply membrane, fully adhered, over insulation.

B. Roofing Assembly Performance Requirements and Design Criteria:
   1. Roof Covering External Fire Resistance Classification: Class A when tested per UL 790.
   2. Wind Uplift:
      a. Designed to withstand wind uplift forces calculated with ASCE 7.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Single Source Responsibility: Provide and install products from single source per building project.
   1. Elementary School Addition: Roof Membrane to match existing building
      a. Product: Sika Sarnafil PVC with Décor ribs

B. Membrane:

1. Material: Polyvinyl chloride (PVC) complying with ASTM D4434/D4434M.
2. Reinforcing: Internal fabric.
3. Thickness: 60 mils (0.060 inch), minimum.
4. Sheet Width: Factory fabricated into largest sheets possible.
5. Color: To be selected by Architect from manufacturer's full color range.
6. Products:
    a. Carlisle; 60 mil SureFlex PVC: www.carlislesyntec.com.
    b. Duro-Last; 60 mil, Duro-last Membrane: www.duro-last.com.
    c. Elevate; 60 mil, PVC Membrane: www.holcimelevate.com.
    d. Sika Sarnafil; S 237-60 EnergySmart: www.usa.sika.com.

C. Seaming Materials: As recommended by membrane manufacturer.

D. Flexible Flashing Material: Same material as membrane.

2.04 INSULATION

A. See Section 07 22 16 - Roof Board Insulation for roofing insulation.

2.05 ACCESSORIES

A. Prefabricated Roofing Expansion Joint Flashing: Sheet butyl over closed cell foam backing seamed to galvanized steel flanges.

B. Prefabricated Flashing Accessories:
1. Corners and Seams: Same material as membrane, in manufacturer's standard thicknesses.
2. Penetrations: Same material as membrane, with manufacturer's standard cut-outs, rigid inserts, clamping rings, and flanges.
3. Walkway Rolls: Heat Weldable Walkway Rolls; 80 mils (0.080 inch)thick; gray membrane.
4. Elementary School Addition: Contour Rib Profile: Manufacturer's standard extruded PVC; 1-1/4 inch tall, 2-1/8 inch wide, 3/8 inch profile.
    a. Heat-welded to membrane
    b. Spacing: To match existing elementary school
    c. Color: To match roof membrane and existing elementary school
5. Miscellaneous Flashing: Non-reinforced PVC membrane; 80 mils (0.080 inch) thick, in manufacturer's standard lengths and widths.

C. Membrane Adhesive: As recommended by membrane manufacturer.

D. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

E. Sealants: As recommended by membrane manufacturer.

F. Cleaner: Manufacturer's standard, clear, solvent-based cleaner.

G. Primer: Manufacturer's recommended product.

H. Edgings and Terminations: As specified in Section 07 71 00 - Roof Specialties.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 PREPARATION, GENERAL

A. Clean substrate thoroughly prior to roof application.

3.03 INSTALLATION - GENERAL

A. Perform work in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Do not apply roofing membrane during unsuitable weather.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.04 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application:
   1. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints.
   2. Fully adhere one roll before proceeding to adjacent rolls.

D. Seam Welding:
   1. Overlap edges and ends and seal seams by heat welding, minimum 2 inches.
   2. Cover all seams with manufacturer's recommended joint covers.
   3. Probe all seams once welds have thoroughly cooled. (Approximately 30 minutes.)
   4. Repair all deficient seams within the same day.
   5. Seal cut edges of reinforced membrane after seam probe is complete.

E. At intersections with vertical surfaces:
   1. Fully adhere flexible flashing over membrane and up to nailing strips.

F. Install roofing expansion joints where indicated. Make joints watertight.

G. Install prefabricated joint components in accordance with manufacturer's instructions.

H. Install walkway pads. Space pad joints to permit drainage.

I. Daily Seal: Install daily seal per manufacturers instructions at the end of each work day. Prevent infiltration of water at incomplete flashings, terminations, and at unfinished membrane edges.

3.05 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance for general requirements for field quality control and inspection.

B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.06 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove wrappings, empty containers, paper, and other debris from the roof daily. Dispose of debris in compliance with local, State, and Federal regulations.

C. Remove bituminous markings from finished surfaces.

D. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

E. Repair or replace defaced or damaged finishes caused by work of this section.

3.07 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION 07 54 19

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, exterior penetrations, soffit and related trims, and other items indicated in Schedule.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Metal flashings embedded in masonry.

B. Section 06 10 00 - Rough Carpentry: Wood nailers for sheet metal work.

C. Section 07 61 00 - Sheet Metal Roofing.

D. Section 07 71 00 - Roof Specialties: Manufactured copings, flashings, and expansion joint covers.

E. Section 07 71 23 - Manufactured Gutters, Downspouts and Boots.

F. Section 07 72 00 - Roof Accessories: Manufactured metal roof curbs.

G. Section 07 92 00 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 ALTERNATIVES

A. See Section 01 23 00 - Alternates, for product alternatives affecting this section.

1.04 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; 2023.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

D. CDA A4050 - Copper in Architecture - Handbook; Current Edition.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.07 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 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.

1.08 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.

1.09 WARRANTY

A. Provide a 20 year warranty for manufacturer approved 70 percent Kynar colors for the painted finish covering color fade, chalk, and film integrity.

PART 2 PRODUCTS

2.01 ACCESSORIES

A. Pre-Finished Aluminum: ASTM B 209 (ASTM B 209M); 0.050 inch thick; plain finish shop pre coated with fluoropolymer coating of color as selected.

1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as scheduled.

B. General: Provide trim/flashing, fascias, ridge, valley, closures, gutters, gutter hangers and other related required items to provide a complete system

C. Fasteners: Same metal as flashing/sheet metal or other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed fasteners the same as the material being fastened.

D. Epoxy Seam Sealer: Two (2) part noncorrosive metal seam cementing compound for exterior and interior nonmoving joints.

E. Metal Accessories: Provide sheet metal flashings, clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed.

2.02 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239 inch) thick base metal.

B. Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; anodized finish of color as selected.

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.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Comply with manufacturers installation instructions, manufacturers recommendations and SMACNA 'Architectural Sheet Metal Manual'

B. Install in accordance with manufacturer's installation instructions.

C. Install work with provisions for thermal expansion of flashings, gravel stops, fascia, copings, reglets, and other items exposed for more than 20 feet of continuous length. Maintain as watertight installation at expansion seams.

D. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

E. Apply plastic cement compound between metal flashings and felt flashings.

F. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

G. Seal metal joints watertight.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.05 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for field inspection requirements.

END OF SECTION 07 62 00

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including counterflashings, copings.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry

B. Section 07 54 19 - PVC Thermoplastic Single-Ply Roofing

C. Section 07 61 00 - Sheet Metal Roofing

D. Section 07 62 00 - Sheet Metal Flashing and Trim

E. Section 07 72 00 - Roof Accessories: Manufactured curbs, roof hatches.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

C. AAMA 2605 - Voluntary Specification , Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.

D. NRCA (RM) - The NRCA Roofing Manual; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Samples: Submit two samples, illustrating component shape, finish, and color.

E. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. Architectural Products Co: www.archprod.com/
   2. ATAS International, Inc; Rapid-Lok Fascia: www.atas.com/
   3. Metal-Era Inc: www.metalera.com/
   4. Metal Roofing Systems, Inc; Rapid Lock Coping: www.metalroofingsystems.biz/
   5. MM Systems Corp.; Product FWC Wall Cap.

2.02 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
   1. Configuration: Fascia, and edge securement for roof membrane.
   2. Material: Formed steel sheet, galvanized, 22 gage, 0,03 inch thick, minimum.

3. Finish: 70 percent polyvinylidene fluoride.

2.03 PREFABRICATED COPING SYSTEMS

A. Manufacturer:
   1. Metal Era, Waukesha, Wisconsin:
   2. Acceptable Manufacturers:
      a. MM Systems Company, Tucker, Georgia
      b. Architectural Products Co
      c. W.P. Hickman, Asheville, North Carolina
      d. Substitutions: See Section 01 60 00 - Product Requirements

B. Perma-Tite Coping: Metal coping cap with snap-on design with 20-gauge, galvanized steel anchor clips and factory-applied stainless steel springs that ensure long-term positive attachment, extruded anchor bar and galvanized steel anchor/support cleats for capping parapet wall. The system shall be watertight, maintenance free, and does not require exposed fasteners. Joints shall be a butt type with concealed splice plates.

C. Characteristics:
   1. Coping sections shall expand and contract freely while locked in place on anchor cleats.
   2. Coping sections shall lock to extruded aluminum anchor bar and anchor cleats by mechanical pressure from hardened stainless steel springs factory attached to anchor cleats.
   3. All splice plates include factory applied dual non-curing sealant strips capable of providing a watertight seal.
   4. Metal: 0.050" aluminum with Kynar coating.
      a. Color to be selected by the Architect from manufacturer's standards

D. Coping cap: length of 12'-0" (3.65 m), widths manufactured to job requirements.

E. Coping vertical outside face to be: 6", back leg standard to be 3-1/2" nominal, custom size by request, manufactured to job requirements.

F. Concealed splice plates: 8" wide. Finish to match finish of coping cap with factory applied dual non-curing sealant strips.

G. Extruded Anchor Bar: .100" mill extruded aluminum, pre-punched, 12" wide and installed 4'-0" o.c. Integrated with anchor/support cleat.

H. Anchor/Support Cleat: 20 ga. prepunched galvanized cleat with stainless steel spring mechanically locked to cleat normally 12" (305 mm) wide @ 6'-0" (1525 mm) on center. Mechanically fastened as indicated and detailed. Integrated with extruded anchor bar.

I. Fasteners: Corrosion resistant fasteners shall be provided by Metal-Era. No exposed fasteners shall be permitted.

J. Finishes: Shall be select from full range of pre-coated Kynar 500 from manufacturer's colors.

K. Accessories:
   1. Corners, end caps, pier caps, etc. shall be fabricated by the coping manufacturer.
      a. Welded assembly shall be used to maintain watertight integrity.

L. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.

2.04 PREFABRICATED REGLETS AND COUNTERFLASHING

A. Manufacturer:
   1. Metal Era, Waukesha, Wisconsin:
   2. Acceptable Manufacturers:

a. MM Systems Company, Tucker, Georgia
b. W.P. Hickman, Asheville, North Carolina
c. Architectural Products Co
d. Substitutions: See Section 01 60 00 - Product Requirements

B. Product; Two Piece Counterflashing Reglet version
1. Material: 0.050 Aluminum
2. Finish: Kynar 500, fluoropolymer coating
3. Height: 5 5/8 inches with 3 inch factory endlaps
4. Accessories: Factory mitered and sealed corners.

2.05 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.06 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

C. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

END OF SECTION 07 71 00

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof curbs.

B. Roof penetrations mounting curbs.

C. Roof hatches.

1.02 RELATED REQUIREMENTS

A. Section 07 61 00 - Sheet Metal Roofing: Standing seam roof panels.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

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 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Roof Curbs Manufacturers:
   1. AES Industries Inc: www.aescurb.com/
   2. The Pate Company: www.patecurbs.com/
   3. LMCurbs; Roof Curbs: www.lmcurbs.com/
   4. MKT Metal Manufacturing: www.mktduct.com/
   5. Roof Products & Systems (RPS): www.rpscurbs.com/
   6. Nystrom Building Products.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Roof Curb Mounting Substrate: Curb substrate consists of either PVC membrane or Asphalt shingles.
   2. Sheet Metal Material:
      a. Aluminum: 0.080 inch minimum thickness, with 3003 alloy, and H14 temper.
         1) Color: As selected by Architect from manufacturer's standard line of colors.
   3. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing system at 1:1 slope; minimum cant height 4 inches.

C. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of curb.

2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
3. Height Above Finished Roof Surface: 8 inches, minimum.

2.02 ROOF HATCHES AND VENTS

A. Roof Hatch Manufacturers:
1. Acudor Products Inc; Aluminum Thermally Broken Roof Hatch: www.acudor.com.
2. Babcock-Davis; ThermalMAX Thermally Broken Roof Hatch: www.babcockdavis.com.
3. Bilco Company; Thermally Broken Roof Hatch: www.bilco.come.
4. Nystrom, Inc; ThermalMAX: www.nystrom.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Roof Hatches and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
1. Style: Provide flat metal covers unless otherwise indicated.
2. Mounting Substrate: Provide frames and curbs suitable for mounting on flat roof deck sheathing with insulation.
3. Thermally Broken Hatches: Provide insulation within frame and cover.
4. For Ladder Access: Single leaf; 30 by 36 inches.

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
1. Material: Mill finished aluminum, 11 gauge, 0.0907 inch thick.
2. Insulation: Manufacturer's standard; 1 inch rigid glass fiber or foam plastic, located on outside face of curb.

D. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.
6. Locking: Padlock hasp on interior.

2.03 SNOW GUARDS

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 07 72 00

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide labor, materials and equipment necessary to complete sealant work, both interior and exterior of the Project.

B. Nonsag gunnable joint sealants.

C. Self-leveling pourable joint sealants.

D. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping: Firestopping sealants.

B. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

C. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

D. Section 23 31 00 - HVAC Ducts and Casings: Duct sealants.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

F. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

G. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with other sections referencing this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, service temperature range, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

D. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

1.07 MOCK-UP

A. Provide mock-up of sealant joints in conjunction with window, wall, and air barrier system under provisions of Section 01 43 00 - Quality Requirements.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed.

D. Mock-up may not remain as part of the Work.

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.

C. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a two (2) year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Joints and intersections in concrete paving.
      f. Joints and intersections between dissimilar materials that do not fit together with a hairline joint.
      g. Intersections of equipment that do not fit together or against adjoining material with a hairline joint.
      h. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.

b. Joints and intersections between dissimilar materials that do not fit together with a hariline joint.
c. Intersections of equipment that do not fit together or against adjoining material with a hairline joint.
d. Other joints indicated below.

3. Do not seal the following types of joints.
a. Intentional weepholes in masonry.
b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
d. Joints where installation of sealant is specified in another section.
e. Joints between suspended panel ceilings/grid and walls.

B. General Project Recomendations
1. Type 1 - Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
2. Type 2 - Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
3. Type 3 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
4. Type 4 - Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
5. Type 5 - Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
6. Type 6 - In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

C. Interior Wet Areas: Bathrooms, restrooms, and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

D. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.02 JOINT SEALANTS - GENERAL

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

B. Single source responsibility for joint sealant materials: Obtain joint sealant materials from a single manufacturer.

C. Compatibility: Provide joint sealant, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and experience.

2.03 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
5. Color: To be selected by Architect from manufacturer's standard range.
6. Service Temperature Range: Minus 20 to 180 degrees F.
7. Applications: Use for:
a. Metal to metal joint.

b. Glass to glass joints.
c. Sheet metal flashing, coping, preformed metal caps, fascia, extenders trim and panels.
d. Glass to metal joints.
e. Concrete to concrete, including precast panels

8. Manufacturers:
a. Dow Chemical Company; DOWSIL 795 Silicone Building Sealant: www.dow.com.
b. Pecora Corporation; Pecora 864 NST (Non-Staining Technology): www.pecora.com.
c. Sika Corporation; Sikasil WS-290: www.usa-sika.com.
d. Tremco, Inc.; Product Spectrum 2: www.tremcosealants.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White or as selected by Architect
2. Applications: Use for:
a. Around countertops, backsplashes and other wet interior locations.
3. Manufacturers:
a. Dow Chemical Company; DOWSIL 791 Silicone Weatherproofing Sealant: www.dow.com.
b. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com.
c. Sika Corporation; Sikasil GP: www.usa-sika.com.
d. Tremco, Inc; Tremsil 200: www.tremcosealants.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. 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.
6. Manufacturers:
a. Pecora Corporation; DynaTrol II: www.pecora.com.
b. Sika Corporation; Sikaflex-1a: www.usa-sika.com.
c. Sika Corporation; Sikaflex-2c NS: www.usa-sika.com.
d. Tremco Commercial Sealants & Waterproofing; Dymonic 100: www.tremcosealants.com.
e. W. R. Meadows, Inc; POURTHANE NS: www.wrmeadows.com.
f. Substitutions: See Section 01 60 00 - Product Requirements.

D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Grade: ASTM C834; Grade Minus 18 Degrees C (0 Degrees F).
3. 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.

4. Manufacturers:
   a. Everkem Diversified Products, Inc; EcoTex 25: www.everkemproducts.com.
   b. Pecora Corporation; AC-20 +Silicone: www.pecora.com.
   c. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com.
   d. Tremco Commercial Sealants & Waterproofing; Tremflex 834: www.tremcosealants.com.
   e. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 SELF-LEVELING SEALANTS

A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Applications: Use for:
      a. Joints in sidewalks and vehicular paving.
   6. Manufacturers:
      a. Pecora Corporation; Dynatrol II-SL: www.pecora.com.
      b. The QUIKRETE Companies; QUIKRETE® Polyurethane Self-Leveling Sealant: www.quikrete.com.
      c. Sika Corporation; Sikaflex-1c SL: www.usa-sika.com.
      d. W. R. Meadows, Inc; POURTHANE SL: www.wrmeadows.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

B. Semi-Rigid Self-Leveling Polyurea Joint Filler: Two-component, 100 percent solids; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
   1. Durometer Hardness, Type A: 75, minimum, after seven days when tested in accordance with ASTM D2240.
   2. Color: Concrete gray.
   3. Joint Width, Minimum: 1/8 inch.
   4. Joint Width, Maximum: 3/4 inch.
   5. Joint Depth: Provide product suitable for joints from 1/8 inch to 1 inch in depth excluding space for backer rod.
   6. Application: Use for
      a. Joint filler for concrete slab saw cuts and narrow cracks.
   7. Manufacturers:
      a. Adhesives Technology Corporation; Crackbond JF-311: www.atcepoxy.com.
      b. ARDEX Engineered Cements; ARDEX ArdiSeal: www.ardexamericas.com.
      c. Nox-Crete; DynaFlex JF-85: www.nox-crete.com.
      d. Sika Corporation - Sika Loadflex - Load Bearing Semi Rigid Polyurea Joint Filler; www.sika-usa.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

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. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Concrete Floor Joint Filler: After full cure, 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 07 92 00

SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion joint cover assemblies for roof surfaces.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete

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.

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 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Samples: Submit two samples 12 inch long, illustrating profile, dimension, color, and finish selected.

D. 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. Basis of Design: Balco; https://www.balcousa.com
      a. Architectural Art Mfg, Inc: www.archart.com/#sle.
      b. Construction Specialties, Inc: www.c-sgroup.com/#sle.
      c. Inpro: www.inprocorp.com
      d. MM Systems Corp: www.mmsystemscorp.com/#sle.
      e. Nystrom, Inc: www.nystrom.com/#sle.
      f. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Roof Expansion Joint Assemblies:
   1. Manufacturers:
      a. Balco; BRB – Traditionalhttps://www.balcousa.com
         1) Bellow System
            (a) Joint Size: As noted on the drawings
            (b) Movement: ±50% to ±100% Expansion/Contraction; ±50% to ±100% Vertical Shear

(c) Performance: Thermal and wind movement per ASTM E1399

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.

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 at Floors: Mill finish or natural anodized.

B. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

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.

3.03 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

B. Provide strippable coating to protect finish surface.

END OF SECTION 07 95 13

SECTION 07 42 13.23
METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior cladding consisting of formed metal composite material (MCM) sheet, secondary supports, and anchors to structure, attached to solid backup.

B. Matching flashing and trim.

1.02 RELATED REQUIREMENTS

A. Section 01 60 00 - Product Requirements

B. Section 04 20 00 - Unit Masonry: Installation of anchors.

C. Section 05 41 00 - Structural Metal Stud Framing: Panel support framing.

D. Section 07 25 00 - Weather Barriers: Weather barrier behind wall panel system.

E. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashing components integrated with this wall system.

F. Section 07 92 00 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

A. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2025b.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2023.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

H. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

I. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives; 1998 (Reapproved 2021).

J. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, co-ordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.

1. Require attendance by the installer and relevant sub-contractors.

2. Include MCM sheet manufacturer's representative and wall system manufacturer's representative to review storage and handling procedures.
3. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
4. Review procedures for protection of work and other construction.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
1. Finish manufacturer's data sheet showing physical and performance characteristics.
2. Storage and handling requirements and recommendations.
3. Fabrication instructions and recommendations.
4. Specimen warranty for finish, as specified herein.

C. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
1. Physical characteristics of components shown on shop drawings.
2. Storage and handling requirements and recommendations.
3. Installation instructions and recommendations.
4. Specimen warranty for wall system, as specified herein.

D. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, exposed fasteners, number of anchors, supports, reinforcement, trim, flashings, and accessories.
1. Indicate panel numbering system.
2. Differentiate between shop and field fabrication.
3. Indicate substrates and adjacent work with which the wall system must be coordinated.
4. Include large-scale details of anchorages and connecting elements.
5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.

E. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

F. Installer's Qualifications.

G. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.

H. Maintenance Data: Care of finishes and warranty requirements.

I. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Field Measurements: Verify actual dimensions by field measurement before fabrication; show recorded measurements on shop drawings.

B. Mock-Up: Provide a mock-up for evaluation of fabrication workmanship.
1. Locate where directed.
2. Provide panels finished as specified.
3. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
   1. Protect finishes by applying heavy duty removable plastic film during production.
   2. Package for protection against transportation damage.
   3. Provide markings to identify components consistently with drawings.
   4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   1. Store in well ventilated space out of direct sunlight.
   2. Protect from moisture and condensation with tarpaulins or other suitable weather tight covering installed to provide ventilation.
   3. Store at a slope to ensure positive drainage of any accumulated water.
   4. Do not store in any enclosed space where ambient temperature can exceed 120 degrees F.
   5. Avoid contact with any other materials that might cause staining, denting, or other surface damage.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Wall System Warranty: Provide joint written warranty by manufacturer and installer, agreeing to correct defects in manufacturing or installation within a two year period after Date of Substantial Completion.
   1. Chalking: No more than that represented by a No. 8 rating based on ASTM D4214.

C. MCM Sheet Manufacturer's Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 20 years:
   1. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
   2. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Composite Material (MCM) Sheet Manufacturers:
   1. 3A Composites USA; Alucobond: www.alucobondusa.com.
   2. East Coast Metal Systems; Composite Panels
   3. Sobetec Ltd. www.sobetec.com ; SL 2000
   4. Centria; Intercept: Entyre www.centria.com
   5. Citadel Architectural Products, Inc; Envelope 2000: www.citadelap.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 WALL PANEL SYSTEM

A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage or failure.
   1. Provide panel jointing and weatherseal using reveal joints and gaskets but no sealant.
   2. Anchor panels to supporting framing without exposed fasteners.

B. PERFORMANCE REQUIREMENTS

1. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.

C. Panels: 2 inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
   1. Reinforce corners with riveted aluminum angles.
   2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.
   3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.
   4. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
   5. Fabricate panels under controlled shop conditions.
   6. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
   7. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
      a. Keep plane surfaces free from warp or buckle.
      b. Keep panel surfaces free of scratches or marks caused during fabrication.
   8. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.
   9. For "dry" jointing, secure extrusions to returned pan edges with stainless steel rivets; provide means of concealed drainage with baffles and weeps for water that might accumulate in members of system.

2.03 MATERIALS

A. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a core of extruded thermoplastic material; no foamed insulation material content.
   1. Overall Sheet Thickness: 4 mm.
   2. Face Sheet Thickness: 0.019 inches, minimum.
   3. Alloy: Manufacturer's standard, selected for best appearance and finish durability.
   4. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
   5. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
   6. Flammability: Self-ignition temperature of 650 degrees F or greater, when tested in accordance with ASTM D1929.
   7. Color/Texture:
      a. Color 1: To match "Tri-Corn Black" by Alucobond
      b. Color 2: To match "Patriot Red" by Alucobond

B. Metal Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
   1. Provide material strength, dimensions, configuration as required to meet the applied loads applied and in compliance with applicable building code.

2. Sheet Steel Components: ASTM A653/A653M galvanized to G90/Z275 or zinc-iron alloy-coated to A60/ZF180; or ASTM A792/A792M aluminum-zinc coated to AZ60/AZM180.
3. Stainless Steel Sheet Components: ASTM A480/A480M.
4. Aluminum Components: ASTM B209 (ASTM B209M); or ASTM B221 (ASTM B221M).

2.04 ACCESSORIES

A. Flashing: Sheet aluminum; 0.040 inch thick, minimum; finish and color to match MCM sheet; refer to Section 07 62 00 for additional requirements.

B. Anchors, Clips and Accessories: Use one of the following:

C. Fasteners:
1. Exposed Fasteners: Stainless steel; permitted only where absolutely unavoidable and subject to prior approval of the Architect.
2. Screws: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
3. Bolts: Stainless steel.

D. Joint Sealer: Provide color to match wall panels silicone sealant of type approved by MCM sheet manufacturer, and in compliance with ASTM C920.

E. Provide panel system manufacturer's and installer's standard corrosion resistant accessories, including fasteners, clips, anchorage devices and attachments.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine dimensions, tolerances, and interfaces with other work.

B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturers written instructions.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work areas and finish surfaces from damage during installation.

B. Provide anchorage items to be cast into concrete or built into masonry to appropriate installer(s) together with setting templates.

3.03 INSTALLATION

A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.

B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.

C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.

D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.

E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.

F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.

G. Where joints are designed for field applied sealant, seal joints completely with specified sealant.

H. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
   1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
   2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
   3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
   4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.

I. Replace damaged products.
   1. Exception: Field repairs of minor damage to finishes are permitted only when approved in writing by Architect, panel manufacturer, and fabricator.
   2. Field Repairs to Finishes: Using materials and methods sufficient that repairs are not discernible when viewed at distance of 10 feet under all typical light conditions experienced at the project.

3.04 FIELD QUALITY CONTROL

A. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.

3.05 CLEANING

A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.

B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.

C. Remove temporary coverings and protection of adjacent work areas.

D. Clean installed products in accordance with manufacturer's instructions.

3.06 PROTECTION

A. Protect installed panel system from damage until Date of Substantial Completion.

END OF SECTION 07 42 13.23

SECTION 08 06 71

Hardware Sets

Set: 1.0

Doors: A100a

Description: Exterior Aluminum - Panic Egress Pair - Active Leaf x Access Control Function x Auto-Door

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Keyed Removable Mullion	L980	PC	SA
1	Elec Rim Exit Device, EL/RX/LX/CD/NL Pull	16 53 55 56 64 PE8504 862	US32D	SA
1	Mullion Cylinder Kit	64 980C	US26D	SA
3	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Conc Overhead Stop	6-336	630	RF
1	Automatic Opener	6061 (D)	689	NO
1	Threshold	253x3AFG FHSL14SS		PE
1	Access Control Reader	By Security Contractor		OT
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
2	ADA Switch	5xx as req'd		NO
1	Door Position Switch	DPS-M-GY		SU
1	Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes: Size threshold for door pair.
Entry by valid input at reader to retract latch or manual key when locked. Free egress at all times.
Push / Pull operation as needed by timed unlock via access control system or mechanically with lock cylinder in panic bar.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Auto-Door system must be integrated with electronic latching hardware.
Exterior ADA switch is controlled by latch monitor in exit device and is active only when door is unlocked.
Vestibule ADA switch will always trigger latch retraction for assisted egress when locked.
Coordinate with electrical and security contractors.

Set: 2.0

Doors: 111a

Description: Exterior Aluminum - Panic Egress Pair - Active Leaf x Access Control Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Keyed Removable Mullion	L980	PC	SA
1	Elec Rim Exit Device, EL/RX/CD NL Pull	16 55 56 64 PE8504 862	US32D	SA

1	Mullion Cylinder Kit	64 980C	US26D	SA
3	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Threshold	253x3AFG FHSL14SS		PE
1	Access Control Reader	By Security Contractor		OT
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes: Size threshold for door pair.
Entry by valid input at reader to retract latch or manual key when locked. Free egress at all times.
Push / Pull operation as needed by timed unlock via access control system or mechanically with lock cylinder in panic bar.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 3.0

Doors: 111b, A100b

Description: Exterior Aluminum - Panic Egress Pair - Inactive Leaf x Exit Only Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, RX/Exit Only	LD 55 PE8510 EO	US32D	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
No entry when locked. Free egress at all times.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 4.0

Doors: A100c

Description: Exterior Aluminum - Panic Egress Pair - Active Leaf x Exit Only Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Keyed Removable Mullion	L980	PC	SA
1	Rim Exit Device, RX/Exit Only	LD 55 PE8510 EO	US32D	SA
1	Mullion Cylinder Kit	64 980C	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Threshold	253x3AFG FHSL14SS		PE
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes: Size threshold for door pair.
No entry when locked. Free egress at all times.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 5.0

Doors: A100d

Description: Exterior Aluminum - Panic Egress Pair - Inactive Leaf x Exit Only Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, RX/Exit Only	LD 55 PE8510 EO	US32D	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
No entry when locked. Free egress at all times.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 6.0

Doors: A105h

Description: Exterior Aluminum - Panic Egress - Access Control Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Elec Rim Exit Device, EL/RX/NL Pull	LD 55 56 64 PE8504 862	US32D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Threshold	253x3AFG FHSL14SS		PE
1	Access Control Reader	By Security Contractor		OT
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
Entry by valid input at reader to retract latch or manual key. Free egress at all times.
Push / Pull operation as needed by timed unlock via access control system.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 7.0

Doors: A105g

Description: Exterior Aluminum - Panic Egress - Exit Only Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, RX/Exit Only	LD 55 PE8510 EO	US32D	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Threshold	253x3AFG FHSL14SS		PE
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
No entry. Free egress at all times.
Door position switch to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 8.0

Doors: A106a

Description: Exterior HM - Panic Egress - Classroom Security Function

3	HW Hinge	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, RX/Locking Lever x Indicator	LD 49 55 64 PE8816 WEL	US32D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Kick Plate	K1050 10" HGT x BEV x CSK	US32D	RO
1	Rain Guard	346C		PE
1	Perimeter Gasketing	303APK TKSP		PE
1	Sweep	345APK TKSP		PE
1	Threshold	253x3AFG FHSL14SS		PE
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU

Notes:
Entry by manual key when locked. Free egress at all times.
Exterior lever trim can be locked/unlocked from interior with key. Interior indicator shows locking status.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 9.0

Doors: A106c, A119a, A120b

Description: Exterior HM - Panic Egress - NL Function x Pull

3	HW Hinge	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, RX/NL Pull	LD 55 64 PE8804 FSL	US32D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Kick Plate	K1050 10" HGT x BEV x CSK	US32D	RO
1	Rain Guard	346C		PE
1	Perimeter Gasketing	303APK TKSP		PE

1	Sweep	345APK TKSP		PE
1	Threshold	253x3AFG FHSL14SS		PE
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU

Notes:
Entry by manual key only. Free egress at all times.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 10.0

Doors: A101a

Description: Aluminum - Panic Pgress Pair - Active Leaf - Lockable Push / Pull Function x Future Access Control

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Elec CVR Exit Device, EL/RX/CD/NL Pull	NB 16 55 56 64 ADPE8610 P106 x 862	US32D	SA
2	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop & Hold-Open	CPS7500T	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Interior Threshold	271A FHSL14SS		PE
2	Wiring Harness Frame	QC-C3000P		MK
2	Wiring Harness Door	QC-Cx00 for door width		MK
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes: Size threshold for pair of doors.
Entry by manual key when locked. Free egress at all times.
Push / Pull operation as needed by exit device dogging with keyed lock cylinder in panic bar.
Hardware set includes electronic exit device and power transfer components for future access control upgrade.
Coordinate with electrical and security contractors.

Set: 11.0

Doors: A101b

Description: Aluminum - Panic Pgress Pair - Inactive Leaf - Lockable Push / Pull Function

1	Continuous Hinge	CFMxxSL-HD1 for door hgt		PE
1	CVR Exit Device, CD/DT Pull	NB 16 64 ADPE8610 862	US32D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop & Hold-Open	CPS7500T	689	NO

1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
No entry when locked. Free egress at all times.
Push / Pull operation as needed by exit device dogging with keyed lock cylinder in panic bar.

Set: 12.0

Doors: A105a

Description: Aluminum - Panic Egress - Access Control Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Elec Rim Exit Device, EL/CD/NL Pull	16 56 64 PE8504 862	US32D	SA
2	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Access Control Reader	By Security Contractor		OT
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
Entry by valid input at reader to retract latch or manual key. Free egress at all times.
Push / Pull operation as needed by timed unlock via access control system or manually with lock cylinder in panic bar.
Coordinate with electrical and security contractors.

Set: 13.0

Doors: A105b

Description: Aluminum - Panic Egress - Locking Push / Pull Function

1	Continuous Hinge	CFMxxSL-HD1 for door hgt		PE
1	Rim Exit Device, CD/DT Pull	16 64 PE8510 862	US32D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO

1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
No entry when locked. Free egress at all times.
Push/Pull operation as needed by exit device dogging with lock cylinder in panic bar.
Coordinate with electrical and security contractors.

Set: 14.0

Doors: A105f

Description: Aluminum - Access Control Function x Closer w/ Stop

1	Continuous Hinge	CFMxxSL-HD1 for door hgt		PE
1	Storeroom Lock (ALSF)	20 64 10XG04 LL	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Electric Strike	5000C	630	HS
1	Bridge Rectifier	2005M3		HS
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Access Control Reader	By Security Contractor		OT
1	Wiring Harness Frame	QC-C3000P		MK
1	Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
Entry to Weight Room by valid input at reader to release electric strike or manual key.
Free egress at all times.
Coordinate with electrical and security contractors.

Set: 15.0

Doors: A202a

Description: Access Control Function x Closer

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	64 10XG04 LL	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Electric Strike	5000C	630	HS
1	Bridge Rectifier	2005M3		HS
1	Closer	7500/PR7500 as req'd	689	NO
1	Door Stop	400 series as req'd	US26D	RO
3	Silencer	608/609		RO
1	Access Control Reader	By Security Contractor		OT

1 Wiring Harness Frame	QC-C3000P		MK
1 Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU

Notes:
Entry when locked by valid credential to reader to release electric strike or manual key.
Free egress at all times.
Coordinate with electrical and security contractors.

Set: 16.0

Doors: A103

Description: Access Control Function

3 Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lock	64 10XG04 LL	US26D	SA
1 Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1 Electric Strike	5000C	630	HS
1 Bridge Rectifier	2005M3		HS
1 Door Stop	400 series as req'd	US26D	RO
3 Silencer	608/609		RO
1 Access Control Reader	By Security Contractor		OT
1 Wiring Harness Frame	QC-C3000P		MK
1 Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU

Notes:
Entry by valid input at reader to release electric strike or manual key. Free egress at all times.
Coordinate with electrical and security contractors.

Set: 17.0

Doors: A118a, A121, A203

Description: Storeroom Function Pair - Outswing

6 Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Flush Bolt	555/557 for door type	US26D	RO
1 Storeroom Lock	64 10XG04 LL	US26D	SA
1 Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
2 Door Stop	400 series as req'd	US26D	RO
2 Silencer	608/609		RO

Set: 18.0

Doors: A118b

Description: Storeroom Function Pair - Inswing

6	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Flush Bolt	555/557 for door type	US26D	RO
1	Storeroom Lock	64 10XG04 LL	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
2	Door Stop	400 series as req'd	US26D	RO
2	Silencer	608/609		RO

Set: 19.0

Doors: A104, A115
Description: Storeroom Function x Closer

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	64 10XG04 LL	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer	7500/PR7500 as req'd	689	NO
1	Door Stop	400 series as req'd	US26D	RO
3	Silencer	608/609		RO

Set: 20.0

Doors: A105j, A107b
Description: Storeroom Function x Overhead Stop

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	64 10XG04 LL	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Conc Overhead Stop	1-336	652	RF
1	Interior Threshold	271A FHSL14SS		PE
3	Silencer	608/609		RO

Notes: Entry to Weight Room by key only. Free egress fo Field at all times

Set: 21.0

Doors: A116, A117
Description: Storeroom Function

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	64 10XG04 LL	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Door Stop	400 series as req'd	US26D	RO
3	Silencer	608/609		RO

Set: 22.0

Doors: A102
Description: Office Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Entry/Office Lock	64 10XG05 LL	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Door Stop	400 series as req'd	US26D	RO
3	Silencer	608/609		RO
1	Coat Hook	RM828	US32D	RO

Set: 23.0

Doors: A108, A109
Description: Privacy Function w/ Indicator x Closer

3	Hinge	TA2314 4-1/2" x 4-1/2"	US26D	MK
1	Privacy Lock w/ Indicator	V20 8265 LNL	US26D	SA
1	Closer	7500/PR7500 as req'd	689	NO
1	Kick Plate	K1050 10" HGT x BEV x CSK	US32D	RO
1	Door Stop	400 series as req'd	US26D	RO
3	Silencer	608/609		RO
1	Coat Hook	RM828	US32D	RO

Set: 24.0

Doors: A114
Description: Push / Pull Function - Lockable

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Public Toilet Deadlock	64 4878	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Pull Plate	BF 123x70C CFTT/CFC as req'd	US32D	RO
1	Push Plate	70E CFTT/CFC as req'd	US32D	RO
1	Closer	7500/PR7500 as req'd	689	NO
1	Kick Plate	K1050 10" HGT x BEV x CSK	US32D	RO
1	Door Stop	400 series as req'd	US26D	RO
1	Interior Threshold	271A FHSL14SS		PE
3	Silencer	608/609		RO

Set: 25.0

Doors: A110a, A110b, A112a, A112b
Description: Push / Pull Function - Restrooms

3	Hinge	TA2314 4-1/2" x 4-1/2"	US26D	MK
1	Pull Plate	BF 123x70C	US32D	RO
1	Push Plate	70E	US32D	RO
1	Closer	7500/PR7500 as req'd	689	NO
1	Kick Plate	K1050 10" HGT x BEV x CSK	US32D	RO
1	Door Stop	400 series as req'd	US26D	RO
3	Silencer	608/609		RO

Set: 26.0

Doors: A105c, A105d, A106b, A107a, A119b, A120c, A202b
Description: Miscellaneous Doors

1	All Hardware	By Door System Mfr.		OT

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
5. Division 08 Section "Door Hardware".
6. Division 08 Section "Access Control Hardware".
7. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. 10. SDI-113 Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door & Frame Assemblies.

10. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
11. ASTM C1199 - Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods
12. ASTM E1423 - Practice for Determining Steady State Thermal Transmittance of Fenestration Systems.
13. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
14. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
15. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
16. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
17. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
18. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
19. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Storm Shelter Openings: Provide complete door systems for hurricane or tornado storm shelters, and other areas of refuge, complying and tested according to ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.

1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Pioneer Industries (PI).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.

1. Design: Flush panel.
2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds or thermally enhanced stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".

    a. Provide 22-gauge steel stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
    b. Thermal properties to rate at a fully operable minimum U-Factor 0.34 and R-Value 2.92, including insulated door, thermal-break frame and threshold.
    c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, including insulated door, kerf type frame, and threshold.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053 inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.

4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Honeycomb Core - 707 Series.
2. Curries Company (CU) - Energy Efficient - 777 Trio-E Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weatherstripping.

C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) - Mercury 3 Thermal Break TQ Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) - M Series.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.

1. Blade Type: Vision proof inverted V or inverted Y.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.9 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Electrical Raceways: Provide hollow metal doors to receive electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware". Wire nut connections are not acceptable.

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
5. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
6. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer

hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".

a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.

7. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
8. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on-center and as follows:

1) Two anchors per jamb up to 60 inches high.
2) Three anchors per jamb from 60 to 90 inches high.
3) Four anchors per jamb from 90 to 120 inches high.
4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.
2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

9. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION

SECTION 08 16 14
FIBERGLASS DOORS

PART 1GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced polyester (FRP) flush doors with hollow metal frames.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry
B. Section 07 9005 - Joint Sealers
C. Section 08 4313 - Aluminum Framed Storefronts
D. Section 08 7100 - Door Hardware.
E. Section 08 8000 - Glazing
F. Section 09 9000 - Painting and Coatings
G. Division 26 - Electrical
H. Division 27 - Communications
I. Division 28 - Electronic Safety

1.03 REFERENCES

A. AAMA 1503-98 - Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
B. ANSI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.
C. ASTM B 117 - Operating Salt Spray (Fog) Apparatus.
D. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
E. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
F. ASTM D 256 - Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.
G. ASTM D 543 - Evaluating the Resistance of Plastics to Chemical Reagents.
H. ASTM D 570 - Water Absorption of Plastics.
I. ASTM D 638 - Tensile Properties of Plastics.
J. ASTM D 790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
K. ASTM D 1308 - Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
L. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics.
M. ASTM D 1623 - Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
N. ASTM D 2126 - Response of Rigid Cellular Plastics to Thermal and Humid Aging.
O. ASTM D 2583 - Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
P. ASTM D 3029 – Impact Resistance of Flat Rigid Plastic Specimens by Means of a Falling Weight.
Q. ASTM D 6670-01 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products.
R. ASTM E 84 - Surface Burning Characteristics of Building Materials.

S. ASTM E 90 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

T. ASTM E 283 - Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

U. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

V. ASTM E 331 - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

W. ASTM F 476 - Security of Swinging Door Assemblies.

X. SFBC PA 201 - Impact Test Procedures.

Y. SFBC PA 203 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

Z. SFBC 3603.2 (b)(5) - Forced Entry Resistance Test.

1.04 PERFORMANCE REQUIREMENTS

A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.

B. Air Infiltration: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 283 at pressure differential of 6.24 psf. Door shall not exceed 0.90 cfm per linear foot of perimeter crack.

C. Water Resistance: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 331 at pressure differential of 7.50 psf. Door shall not have water leakage.

D. Swinging Door Cycle Test, Doors and Frames, ANSI A250.4: Minimum of 25,000,000 cycles.

E. Swinging Security Door Assembly, Doors and Frames, ASTM F 476: Grade 40.

F. Thermal Transmission, Exterior Doors, U-Value, AAMA 1503-98: Maximum of 0.29 BTU/hr x sf x degrees F. Minimum of 55 CRF value.

G. Surface Burning Characteristics, FRP Doors and Panels, ASTM E 84:
   1. Flame Spread: Maximum of 200, Class C.
   2. Smoke Developed: Maximum of 450, Class C.

H. Surface Burning Characteristics, Class A Option On Interior Faces of FRP Exterior Panels and Both Faces of FRP Interior Panels, ASTM E 84:
   1. Flame Spread: Maximum of 25.
   2. Smoke Developed: Maximum of 450.

I. Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 256: 15.0 foot-pounds per inch of notch.

J. Tensile Strength, FRP Doors and Panels, Nominal Value, ASTM D 638: 14,000 psi.

K. Flexural Strength, FRP Doors and Panels, Nominal Value, ASTM D 790: 21,000 psi.

L. Water Absorption, FRP Doors and Panels, Nominal Value, ASTM D 570: 0.20 percent after 24 hours.

M. Indentation Hardness, FRP Doors and Panels, Nominal Value, ASTM D 2583: 55.

N. Gardner Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 3029: 120 in-lb.

O. Abrasion Resistance, Face Sheet, Taber Abrasion Test, 25 Cycles at 1,000 Gram Weight with CS-17 Wheel: Maximum of 0.029 average weight loss percentage.

P. Stain Resistance, ASTM D 1308: Face sheet unaffected after exposure to red cabbage, tea, and tomato acid. Stain removed easily with mild abrasive or FRP cleaner when exposed to crayon and crankcase oil.

Q. Chemical Resistance, ASTM D 543. Excellent rating.
   1. Acetic acid, Concentrated.
   2. Ammonium Hydroxide, Concentrated.
   3. Citric Acid, 10%.
   4. Formaldehyde.
   5. Hydrochloric Acid, 10%
   6. Sodium hypochlorite, 4 to 6 percent solution.

R. Compressive Strength, Foam Core, Nominal Value, ASTM D 1621: 79.9 psi.

S. Compressive Modulus, Foam Core, Nominal Value, ASTM D 1621: 370 psi.

T. Tensile Adhesion, Foam Core, Nominal Value, ASTM D 1623: 45.3 psi.

U. Thermal and Humid Aging, Foam Core, Nominal Value, 158 Degrees F and 100 Percent Humidity for 14 Days, ASTM D 2126: Minus 5.14 percent volume change.

1.05 SUBMITTALS

A. Comply with Section 01 3000 - Administrative Requirements.

B. Product Data: Submit manufacturer's product data, including description of materials, components, fabrication, finishes, and installation.

C. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.

D. Samples:
   1. Door: Submit manufacturer's sample of door showing face sheets, core, framing, and finish.
   2. Color: Submit manufacturer's samples of standard colors of doors and frames.
   3. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
   4. Maintenance Manual: Submit manufacturer's maintenance and cleaning instructions for doors, including maintenance and operating instructions for hardware.
   5. Warranty: Submit manufacturer's standard warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 5 years successful experience.
   2. Door and frame components from same manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying opening door mark and manufacturer.

B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

C. Handling: Protect materials and finish from damage during handling and installation.

1.08 COORDINATION

A. Contractor shall be responsible for coordinating and obtaining necessary information from Hardware and Frame manufacturers to provide door supplier with approved hardware and frame schedules with templates.

1.09 WARRANTY

A. Warrant doors, frames, and factory hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.

B. Warranty Period: Ten years starting on date of substantial completion.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Special-Lite, Inc., Decatur, Michigan 49045 www.special-lite.com.
   1. Product: Series AF-220 with Special-lite fiberglass reinforced polyester (FRP) face sheets..
   2. Acceptable Manufacturers.
      a. Assa Abloy, Ceco Door Fiberglass Reinforced Polyster Door (FRP)
      b. Vale FRP Doors, Collingsale, PA: www.valedoors.com
      c. Commercial Door Systems, Mensalem PA: www.commercialdoorsystems.com
      d. Kawneer
      e. Substitutions: See Section 01 6000 - Product Requirements

2.02 FIBERGLASS FLUSH DOORS

A. Model: AF-220 Flush Doors with Special-Lite fiberglass reinforced polyester (FRP) face sheets.

B. Door Opening Size: As indicated on the Drawings.

C. Construction:
   1. Door Thickness: 1-3/4 inches.
   2. Stiles and Rails: Aluminum Alloy 6063-T5, minimum of 2-5/16-inch depth.
   3. Corners: Mitered.
   4. Provide joinery of 3/8-inch diameter full-width tie rods through extruded splines top and bottom as standard tubular shaped stiles and rails reinforced to accept hardware as specified.
   5. Securing Internal Door Extrusions: 3/16-inch angle blocks and locking hex nuts for joinery.
   6. Furnish extruded stiles and rails with integral reglets to accept face sheets. Lock face sheets into place to permit flush appearance.
   7. Extrude top and bottom rail legs for interlocking continuous weather bar.
   8. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.

D. Face Sheet:
   1. Material: Special Lite FRP, 0.120-inch thickness, finish color throughout. Abuse-resistant engineered surface.
      a. Standard face sheets shall be manufactured using a corrosion resistant resin system with light stabilizing additives. The resin shall be reinforced with fiberglass, 40% by weight.
   2. Texture: Sandstone.
   3. Color: As selected by Architect from manufacturers standard color line - Light Grey 5597

E. Core:
   1. Material: Poured-in-place polyurethane foam.

2. Density: Minimum of 5 pounds per cubic foot.
3. R-Value: Minimum of 9.

F. Cutouts:
1. Manufacture doors with cutouts for required vision lites, louvers, and panels.
2. Factory install vision lites, louvers, and panels.

G. Hardware:
1. Hardware Installation: To factory install all applicable and supplied hardware to doors and frames.
2. Hardware Reinforcement: To provide necessary reinforcement for proper longevity and hardware function; ASTM B 209 and/or ASTM 308.
3. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.

2.03 MATERIALS

A. Aluminum Members:
1. Extrusions: ASTM B 221.
2. Sheet and Plate: ASTM B 209.
3. Components: Door and frame components from same manufacturer.
4. Fasteners:
a. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.
b. Compatibility: Compatible with items to be fastened.
c. Exposed Fasteners: Screws with finish matching items to be fastened.

2.04 FABRICATION

A. Sizes and Profiles: Required sizes for door and frame units, and profile requirements shall be as indicated on the Drawings.

B. Coordination of Fabrication: Field measure before fabrication and show recorded measurements on shop drawings.

C. Assembly:
1. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
2. Remove burrs from cut edges.

D. Welding: Welding of doors or frames is not acceptable.

E. Fit:
1. Maintain continuity of line and accurate relation of planes and angles.
2. Secure attachments and support at mechanical joints with hairline fit at contacting members.

2.05 ALUMINUM FINISHES

A. Anodized Finish: Class I finish, 0.7 mils thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use.

B. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.03 INSTALLATION

A. Install doors in accordance with manufacturer's instructions.

B. Install doors plumb, level, square, true to line, and without warp or rack.

C. Anchor frames securely in place.

D. Separate aluminum from other metal surfaces with bituminous coatings.

E. Install exterior doors to be weathertight in closed position.

3.04 ADJUSTING

A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.05 CLEANING

A. Clean doors promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that would damage finish.

3.06 PROTECTION

A. Protect installed doors to ensure that doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 08 16 14

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric operators and control stations.

B. Wiring from electric circuit disconnect to operators and control stations.

1.02 RELATED REQUIREMENTS

A. Division 26 - Electrical

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; 2023.

B. ITS (DIR) - Directory of Listed Products; current edition.

C. UL (DIR) - Online Certifications Directory; Current Edition.

D. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - 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: Two slats, 6 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. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated openings.

B. Provide products listed and labeled by UL as suitable for the purpose specified and indicated.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of fire rated units and operating hardware assembly.

D. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified and indicated.

1.07 WARRANTY

A. Standard Warranty: Two years from date of owner acceptance against defects in material and workmanship.

1.08

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Metal Doors:
   1. Basis of Design:
      a. Clopay Building Products
   2. Other Acceptable Manufacturers:
      a. Alpine Overhead Doors, Inc: www.alpinedoors.com.
      b. Cornell Iron Works, Inc: www.cornelliron.com.
      c. Overhead Door Company
      d. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 OVERHEAD COILING INTERIOR DOORS

A. Product:
   1. Model: CESD 10 Service Door
   2. Mounting: Interior face mounted on prepared opening

B. Non-Fire-Rated Interior Coiling Doors: Aluminum slat curtain.
   1. Single Thickness Slats: Manufacturer's standard.
   2. Nominal Slat Size: 2-5/8 inches high x required length.
   3. Slat Material: ASTM A 653/A 653M galvanized steel; with a G90 galvanized coating and #16 B&S gauge aluminum
   4. Finish: Anodized, Black color.
   5. Guides, Angles: Primed steel.
      a. Finish: Factory painted, color to match slats.
   6. Hood Enclosure: Manufacturer's standard; primed steel.
      a. Material 24 gauge galvanized steel
      b. Finish: Factory painted, color to match slats.
   7. Operation
      a. Electric operation.
         1) Electric Tube Motor.
         2) Rating: 10 cycles per day
         3) Provide emergency manual crank hoist. Emergency manual crank hoist assembly shall cut operator power when engaged.
         4) Motor shall be protected against overload with an auto-reset thermal sensing device.
         5) Operator Speed: 10-14 RPM.
         6) Control Station: Recess mounted, Open/Close/Stop push buttons
            (a) Momentary contact close operation.
            (b) Locate control stations as shown on drawings
      b. Electric operation.
         1) Model FS, heavy duty, UL listed, gearhead hoist type operator.
         2) Power: 110 Volts, 1 Phase, 3.8 Amps
         3) Size: 1/2 HP
         4) Control Station: Flush Mounted, Three button station with OPEN, CLOSE and STOP. Momentary contact to open and stop, constant pressure to close.
         5) Control Station: Flush Mounted, 3-button OPEN/CLOSE/STOP

6) Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.
7) Speed reduction shall be worm-gear-in-oil-bath gear reducer with synthetic "All Climate" oil. Shall provide 45:1 speed reduction.
8) Operator shall be equipped with an electrically interlocked floor level disconnect and chain hoist for manual operation and an electric solenoid-actuated brake to stop the motor and hold the door in position.

8. Mounting: Surface mounted.
9. Locking:
   a. Motor operated doors: integral gearing of motor operator to provide locking for door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that electrical services have been installed and are accessible.

C. Verify that door opening is plumb, header is level, and dimensions are correct.

D. Notify Architect of any unacceptable conditions or varying dimensions.

E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. 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 08 33 23

SECTION 08 36 13
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 05 50 00 - Metal Fabrications: Steel channel opening frame.

B. Section 08 71 00 - Door Hardware: Lock cylinders.

C. Section 08 80 00 - Glazing: Glazing for door lights.

D. Section 09 91 13 - Exterior Painting: Finish painting.

E. Division 26: Electrical

F. Section 26 05 83 - EQUIPMENT WIRING.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. 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; 2014.

E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

F. 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).

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. ITS (DIR) - Directory of Listed Products; current edition.

J. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.

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

L. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. UL (DIR) - Online Certifications Directory; Current Edition.

O. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - 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. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

E. 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 documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

C. Comply with applicable code for motor and motor control requirements.

D. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Finish Warranty: Provide manufacturer's finish warranty against rust though for 10 years after the Date of Substantial Completion.

D. Delamination Warranty: Provide manufacturer's delamination warranty for 10 years after the Date of Substantial Completion.

E. Warranty: Include coverage for electric motor and transmission.

F. Provide two year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Clopay Building Products Company, Inc; Product 904: www.clopaycommercial.com.

B. Other Acceptable Manufacturers:
   1. Haas Door: haasdoor.com
   2. C.H.I. Overhead Doors: www.chiohd.com.
   3. Fimbel Architectural Door Specialties: www.fimbelads.com.
   4. Overhead Door Company
   5. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ALUMINUM FULL-VIEW DOORS - INTERIOR - CLOPAY 904

A. Aluminum Doors: Stile and rail aluminum with glazed panels; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Door Nominal Thickness: 2 inches thick.
   2. Finish: Factory anodized; Black anodized.
   3. Glazed Lights: Full panel width; set in place with resilient glazing channel.

4. Glass Panel Option: 904 for all sectional door panels with 5/16" Clear Laminated Impact-Rated Glass
5. Electric Operation: Electric control station.

B. Glazing: G-2 Laminated safety glass; single pane; clear; 5/16 inch overall thickness.

2.03 ALUMINUM FULL-VIEW DOORS - EXTERIOR - CLOPAY 904U

A. Aluminum Doors: Stile and rail steel with solid and glazed panels, insulated; side opening operating style with track and hardware; steel complying with ASTM A1011/A1011M.
1. Door Nominal Thickness: 2 1/8 inch thick.
2. Overall Door Height: As indicated on drawings.
3. Overall Door Width: As indicated on drawings.
4. Thermal Transmittance: U-factor of 0.73 Btu/hr sq ft degrees F, maximum.
5. Finish: Black anodized aluminum;
6. Glazed Lights: Full panel width; set in place with resilient glazing channel.
7. Operation: Automatic, electric powered.

B. Glazing: EG-3; Laminated Insulated Glazing Panel; clear; 1 inch overall thickness.

2.04 COMPONENTS

A. Track: High Track - Rolled galvanized steel, 0.090 inch minimum thickness; 2 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 galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.
1. Ten-ball steel roller to be full-floating ball bearing in case hardened steel cases and mounted to fit the taper of the track.

C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.

D. Spring Counterbalance: Torsion spring counterbalance mechanism sized to weight of the door, with a helically wound, oil tempered torsion spring mounted on a steel shaft; cable drum of die cast aluminum with high strength galvanized aircraft cable with minimum 7 to 1 safety factor.
1. High Cycle Spring: 25,000 cycles.

E. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

F. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

G. Head Weatherstripping: EPDM rubber seal, one piece full length.

H. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

I. Lock: Inside side mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior handle.

2.05 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G40/Z120 coating, stucco embossed surface.

B. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

C. Laminated Safety Glass: ASTM C1172 with at least 0.030 inch thick polyvinyl butyral (PVB) interlayer, and in compliance with safety criteria 16 CFR 1201 Categories 1 and 2, and ANSI Z97.1.

2.06 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by a testing agency acceptable to authorities having jurisdiction.

B. Electric Operators:
   1. Mounting: Side mounted on cross head shaft.
   2. Motor Enclosure:
      a. Exterior Doors: NEMA MG 00001, Type 4; open drip proof.
      b. Interior Doors: NEMA MG 00001, Type 1; open drip proof.
   3. 3/4 hp ; manually operable in case of power failure, transit speed of 12 inches per second.
   4. Motor Voltage: 120 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA EN 10250, Type 1.
   7. Opening Speed: 12 inches per second.
   8. Brake: Adjustable friction clutch type, activated by motor controller.
   9. Manual override in case of power failure.
   10. Refer to Section 26 05 83 for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. 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. Recess mounted,within line of sight of door, but not within reach of door.
   3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide NEMA 1 photo eye sensors as required with momentary-contact control device.

E. Disconnect Switch: Factory mount disconnect switch in control panel.

F. Electric Operator: Side mounted on cross head shaft, 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.
   1. Basis of Design:
      a. Chamberlain Group, Inc.: LiftMaster Model DJ
   2. Other Acceptable Manufacturers:
      a. Overhead Door Company: www.overheaddoor.com.
      b. Wayne-Dalton Corporation: www.waynedalton.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

G. Safety Photo Eyes: Safety photo eyes shall be installed for each opening.
   1. Manufacturers
      a. Lift Master, CPS-UN4

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

F. Photo eyes shall be located 6 inches above finished floor elevation.

G. Photo eyes shall be wired to reverse the door upon the light beam being disrupted.

H. Install perimeter trim.

3.04 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

3.05 CLEANING

A. Clean doors and frames and glazing.

B. Remove temporary labels and visible markings.

3.06 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 08 36 13

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

C. Section 08 80 00 - 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 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.

C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

D. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

H. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).

I. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting two weeks before starting work of this section; require attendance by all affected installers.
   1. Coordinate power and security requirements.
   2. Review preparation and installation procedures and coordinating and scheduling required with related work.
   3. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. General Requirements
   1. Provide all submittals in a timely manner to meet the required construction completion schedule.

2. Shop drawings must be prepared wholly by the manufacturer or authorized representative of the manufacture.
    a. Provide documentation of authorization if shop drawing are not prepared by manufacturer.

B. See Section 01 30 00 - Administrative Requirements for submittal procedures.

C. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.

D. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required. Provide 3D isometric drawings with submittals. All submittal drawings are required to be kept on site for review by contractors, A/E team, CM, and Commissioning team members.

E. Samples: Submit two samples 12 x 4 inches in size illustrating finished aluminum surface, glass, and glazing materials.

F. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

G. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

H. Test Results: Provide test results for performance requirements from an independent testing agency for standard systems being used.

I. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

J. Specimen warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least 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. 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 COORDINATION

A. Contractor shall be responsible for coordinating and obtaining necessary information from Hardware and Frame manufacturers to provide door supplier with approved hardware and frame schedules with templates.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Products: Submit a written warranty, executed by the manufacturer, for a period of 5 years years from the date of substantial completion, against defective materials or workmanship, including substantial non-compliance with applicable specification requirements and industry standards, which results in premature failure of the storefront system, finish, factory-glazed glass, or parts, outside of normal wear.
    1. In the event that storefront system or components are found defective, manufacturer will repair or provide replacements without charge.

2. Warranty for all components must be direct from the manufacturer (non pass-through) and non pro-rated for the entire term. Warranty must be assignable to the non-residential owner, and transferable to subsequent owners though its length.

C. Installation: Submit a written warranty, executed by the storefront installer, for a period of 2 years from the date of substantial completion, against defective materials or workmanship, including substantial non-compliance with applicable specification requirements, which result in premature failure.
   1. In the event that installation of storefront system or components is found to be defective, installer will repair or provide replacements without charge.

D. Provide 10 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 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Application:
   1. Exterior door frame with multiple sidelights or transoms
   2. Exterior storefront

B. Front-Set Style, Thermally-Broken, 6 inch deep mullions:
   1. Basis of Design: Kawneer; Trifab 601T: www.kawneer.us.
   2. Other Acceptable Manufacturers:
      a. YKK America Inc; YES 60 TU; www.ykkap.com
      b. Oldcastle Building Envelope; Series 6000 Thermal MultiPlane; www.obe.com
      c. Tubelite Inc; Product 24650 Series; www.tubeliteusa.com
      d. Substitution Procedures: See Section 01 60 00 - Product Requirements.
   3. Vertical Mullion Dimensions: 2 inches wide by 6 inches deep.
   4. Glazing Option: 1 inch

2.02 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING

A. Application:
   1. Interior vestibule door frames
   2. Interior storefronts systems with doors

B. Center-Set Style:
   1. Basis of Design: Tubelite Inc.; Product 4500 Series: www.tubeliteinc.com.
   2. Other Acceptable Manufacturers
      a. Cross Aluminum; E4500: www.crossaluminum.com.
      b. Kawneer; Trifab VG 450: www.kawneer.us.
      c. YKK AP America Inc; Product YES 45 FS: www.ykkap.com.
      d. Oldcastle Building Envelope; Product FG-2000: www.obe.com.
      e. Substitution Procedures: See Section 01 6000 - Product Requirements.
   3. Vertical Mullion Dimensions: 1-3/4 inches wide by 4-1/2 inches deep.

2.03 BASIS OF DESIGN -- SWINGING DOORS

A. Manufacturer
   1. Cross Aluminum Products Inc.: www.crossaluminum.com
   2. Other Acceptable Manufacturers.
      a. Oldcastle Building Envelope: www.obe.com
      b. Tubelite, Inc.: www.tubeliteusa.com
      c. Substitutions: See Section 01 60 00 - Product Requirements

B. Aluminum Flush doors

1. Product: WST-500T Series, Thermal Aluminum Stile and Rail Doors
2. Wide Style.
3. Door Opening Size: refer to drawings
4. Door Assembly:
    a. Door Assembly:
        1) Door Stile: To be aluminum alloy 6063; temper to be T5 with a minimum 3/16" wall thickness.
        2) Stile and Rail Thickness: To be 2" thick tubular extrusion with minimum 3/16" wall thickness.
    b. Stile Width: As shown on the drawings
    c. Rail Widths: As shown the drawings
    d. Pattern: To be smooth.
5. Insulation: Polyisocyanurate Rigid Foam

C. Materials & Accessories
1. Aluminum:
    a. ASTM B 221, alloy and temper to be 6063 T-5
2. Internal Reinforcement
    a. Exposed:
        1) Type: Fasteners exposed will be Philips flathead fasteners unless provided by other supplier.
        2) Finish: Fasteners to match appropriate finish on standard doors and frames.
        3) Concealed: To be standard according to manufacturer's standards.
3. Weather Stripping
    a. Wool Pile
        1) Material: Solid Propylene Base with resilient fibers.
        2) Color: Manufacturer's standard black color.
4. Glazing
    a. Door Glazing: Interlocking door glazing to be screw fastened and removable from interior with moisture seal foam tape applied to both interior and exterior sides of door. Exterior glazing to be non-removable.
    b. Material: To be 1/8" thick extruded channels-6063-T5.
    c. Color: To match finish of door.
5. Frame Glazing: Exterior side Snap-in glazing. Frame gasket to be flush glaze extruded rubber compound; EPDM.
    a. Material: To be aluminum extruded channels-6063-T5.
    b. Color: To match finish of frame.
6. Thermal Bar
    a. Mechanically attached to thermally break tubular extrusions.
        1) Material: To be Polyamide 6.6 with 25% glass fibers
        2) Color: Manufacturer's standard black color.
7. Hardware
    a. Hardware Preparation: To be fabricated at factory according to hardware templates provided.
    b. Hardware Installation: To factory install all applicable and supplied hardware to doors and frames.
    c. Hardware Reinforcement: To provide necessary reinforcement for proper longevity and hardware function; ASTM B 209 and/or ASTM 308.
    d. Door Hardware
        1) Weatherstrip by this section

(a) Wool pile: Solid Propylene Base with resilient fibers in a standard black color.

2) Doorstop: CDM - 32
   (a) Wall Thickness: To be 3/16" thick for receiving applicable hardware.
   (b) Profile Height: To be no less than 5/8" high.
   (c) Snap-in: Fits standard manufacturer's door jamb profiles.
3) See Section 08 7100 Hardware for additional requirements.

2.04 COMPONENTS

A. Glazing: See Section 08 80 00.

B. Swing Doors: Glazed aluminum.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.

D. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.

E. Concealed Flashings: Galvanized steel, 26 gauge, 0.0179 inch minimum base metal thickness.

F. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.06 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.
   1. All locations unless noted otherwise on drawings.

B. Color: As selected by Architect from manufacturer's standard range.
   1. Athletic Complex: Black
   2. Locker Room: Match Existing - Dark Bronze

2.07 HARDWARE

A. For each door, include weatherstripping and sill sweep strip.

B. Other Door Hardware: See Section 08 71 00.

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.

2.08 ACCESSORIES

A. Closed-cell polyurethane spray foam insulation: ASTM C 1029, Type II, 1.5 lb.cu.ft.
   1. Foam insulation required between all windows and doors at head, jamb, and sill

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier 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. Install foam insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Install hardware using templates provided.
   1. See Section 08 71 00 for hardware installation requirements.

K. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 08 80 00.

L. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. The right is reserved by the Owner/Architect to have the installation tested. The cost of this test is at the Owner's expense.
   1. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
      a. Perform a minimum of two tests in each designated area as directed by Architect.
      b. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
      c. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
         1) Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
   2. Replace units that have failed field testing and retest until performance is satisfactory.

3.05 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

C. Protect finished work from damage.

END OF SECTION 08 43 13

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.

C. Related Sections:

1. Division 08 Section "Hollow Metal Doors and Frames".
2. Division 08 Section "Flush Wood Doors".
3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
4. Division 28 Section "Access Control Hardware Devices".

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.

4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.

c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

a. Hager Companies (HA) - BB Series, 5-knuckle.
b. McKinney (MK) - TA/T4A Series, 5-knuckle.
c. dormakaba BEST (ST) - F/FBB Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Hager Companies (HA).
b. Pemko (PE).
c. dormakaba BEST (ST).

2.4 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to

accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

    a. Pemko (PE) - EL-CEPT Series.
    b. Securitron (SU) - EL-CEPT Series.
    c. Von Duprin (VD) - EPT-10 Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Manufacturers:

    a. Hager Companies (HA) - Quick Connect.
    b. McKinney (MK) - QC-C Series.
    c. dormakaba BEST (ST) - WH Series.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood (RO).
    c. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.

2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood (RO).
    c. Trimco (TC).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU).
    b. Sargent Manufacturing (SA).
    c. Schlage (SC).

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard LFIC x Schlage "C" keyway.

C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

F. Construction Keying: Provide temporary keyed construction cores.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets with Occupancy Indicator, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.
c. Schlage (SC) - L9000 Series.

2.8 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - CLX3300 Series.
b. Sargent Manufacturing (SA) - 10X Line.
c. Schlage (SC) - ND Series.

2.9 DEADLOCKS AND LATCHES

A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - DL4000 Series.
b. Sargent Manufacturing (SA) - 4870 Series.

c. Schlage (SC) - L460 Series.

2.10 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.11 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability with field selectable fail-secure/fail-safe. Where specified provide latchbolt monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

a. HES (HS) - 5000/5200 Series.
b. Trine Access Technology (TR) - 2000/2600/4200 Series.
c. Von Duprin (VD) - 4200/5100 Series.

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.12 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as

required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:

    a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
    b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
    c. No catch points: addition of applied deflectors or other added components are not allowed.
    d. No visible plastic.
    e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.
    f. Constructed of all stainless steel.
    g. Stainless steel pullman type latch with deadlock feature.
    h. Narrow or wide style exterior trim as specified in the hardware sets.
    i. Center case adjustability on concealed vertical rod exit devices; single operation with hex key individually adjusts top or bottom latches. No retainer screws or clips required to maintain adjustment.
    j. Ten-year limited warranty for mechanical features.

2. Electromechanical exit devices shall have the following functions and features:

   a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
   b. Wire routing for all non-access control electromechanical functions and EcoFlex trim to be contained within the carrier of the device eliminating the need for cavities in doors to be drilled. Include a protective film so that wires don't get damaged if the rail needs to be removed.
   c. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
   d. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
   e. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.

3. Manufacturers:

   a. Corbin Russwin Hardware (RU) - PED4000 / PED5000 Series.
   b. Sargent Manufacturing (SA) - PE80 Series.
   c. Von Duprin (VD) - 35A/98 XP Series.

2.13 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

a. Corbin Russwin Hardware (RU) - DC6000 Series.
b. Norton Rixson (NO) - 7500 Series.
c. Sargent Manufacturing (SA) - 351 Series.

2.14 ELECTROHYDRAULIC DOOR OPERATORS

A. Electrohydraulic Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that meet ANSI/BHMA A156.4 requirements and are UL listed for use on fire rated doors and UL10C certified that comply with requirements for the Americans with Disabilities Act (ADA). Operators shall be verified by GreenCircle to offer energy savings of 19% when compared to similar products to accommodate openings up 250 pounds and 48" wide. Provide accessories such as custom templates, special mounting brackets, spacers and drop plates as needed for proper installation. Operators shall accommodate openings up to 200 pounds and 48" wide. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide operators with features as follows:

a. Non-handed with push and pull side mounting.
b. Operates as mechanical surface closer during close cycles, when door is opened manually or if power is off.
c. Activation by push button, hands-free or radio frequency devices.
d. On board electronics to collect usage and cycle count data to facilitate preventative maintenance/diagnostics.
e. Two-year limited warranty.
f. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building's IT required.
   1) Simple setup with no app required.
   2) View status and make adjustments without removing the cover.
   3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
g. Mounting backplate to simplify and speed up installation.

2. Operators shall have the following functionality:

a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
c. Infinite Hold Open: Door will hold open at set position until power is turned off.
d. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
e. Open Delay: Delays operator opening for locking hardware.
f. Overload Safety Shut-Off: After two minutes of receiving a door activation signal, inverter times out and door closes to prevent motor/inverter damage.

g. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
h. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
i. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
j. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.

3. Manufacturers:

a. Gyrotech Nabco - GT500 Series.
b. LCN (LC) - 4630/4640 Series.
c. Norton Rixson (NO) - 6000 Series.

2.15 ARCHITECTURAL TRIM AND ACCESSORIES

A. Door Protective Trim:

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

a. Burns Manufacturing (BU).
b. Rockwood (RO).
c. Trimco (TC).

2.16 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other

types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Hager Companies (HA).
    b. Rockwood (RO).
    c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

    a. Norton Rixson (RF).
    b. Rockwood (RO).
    c. Sargent Manufacturing (SA).

2.17 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko (PE).
3. Zero (ZE).

2.18 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Alarm Controls (AK) - CP1-1026 Series.
b. Security Door Controls (SD) - DPS Series.
c. Securitron (SU) - DPS Series.

B. Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Power supplies shall meet all functions and features as specified herein.

a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
b. Tolerates brownout or overvoltage input ± 15% of nominal voltage.
c. Thermal shutdown protection with auto restart.
d. Circuit breaker protection against overcurrent and reverse battery faults.
e. Integrated battery charging circuit to prevent overvoltage on locking devices.
f. Available with a single relay fire trigger or individually triggered relayed outputs.
g. Monitoring options as specified.

2. Manufacturers:

a. Securitron (SU) - AQD Series.

2.19 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.20 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9

Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. RO - Rockwood
5. SA - SARGENT
6. HS - HES
7. RF - Rixson
8. NO - Norton
9. OT - Other

Hardware Sets

Set: 1.0

Doors: A100a

Description: Exterior Aluminum - Panic Egress Pair - Active Leaf x Access Control Function x Auto-Door

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Keyed Removable Mullion	L980	PC	SA
1	Elec Rim Exit Device, EL/RX/LX/CD/NL Pull	16 53 55 56 64 PE8504 862	US32D	SA
1	Mullion Cylinder Kit	64 980C	US26D	SA
3	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Conc Overhead Stop	6-336	630	RF
1	Automatic Opener	6061 (D)	689	NO
1	Threshold	253x3AFG FHSL14SS		PE
1	Access Control Reader	By Security Contractor		OT

1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
2	ADA Switch	5xx as req'd		NO
1	Door Position Switch	DPS-M-GY		SU
1	Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes: Size threshold for door pair.
Entry by valid input at reader to retract latch or manual key when locked. Free egress at all times.
Push / Pull operation as needed by timed unlock via access control system or mechanically with lock cylinder in panic bar.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Auto-Door system must be integrated with electronic latching hardware.
Exterior ADA switch is controlled by latch monitor in exit device and is active only when door is unlocked.
Vestibule ADA switch will always trigger latch retraction for assisted egress when locked.
Coordinate with electrical and security contractors.

Set: 2.0

Doors: 111a

Description: Exterior Aluminum - Panic Egress Pair - Active Leaf x Access Control Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Keyed Removable Mullion	L980	PC	SA
1	Elec Rim Exit Device, EL/RX/CD NL Pull	16 55 56 64 PE8504 862	US32D	SA
1	Mullion Cylinder Kit	64 980C	US26D	SA
3	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Threshold	253x3AFG FHSL14SS		PE
1	Access Control Reader	By Security Contractor		OT
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes: Size threshold for door pair.
Entry by valid input at reader to retract latch or manual key when locked. Free egress at all times.
Push / Pull operation as needed by timed unlock via access control system or mechanically with lock

cylinder in panic bar.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 3.0

Doors: 111b, A100b

Description: Exterior Aluminum - Panic Egress Pair - Inactive Leaf x Exit Only Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, RX/Exit Only	LD 55 PE8510 EO	US32D	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
No entry when locked. Free egress at all times.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 4.0

Doors: A100c

Description: Exterior Aluminum - Panic Egress Pair - Active Leaf x Exit Only Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Keyed Removable Mullion	L980	PC	SA
1	Rim Exit Device, RX/Exit Only	LD 55 PE8510 EO	US32D	SA
1	Mullion Cylinder Kit	64 980C	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Threshold	253x3AFG FHSL14SS		PE
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes: Size threshold for door pair.
No entry when locked. Free egress at all times.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 5.0

Doors: A100d

Description: Exterior Aluminum - Panic Egress Pair - Inactive Leaf x Exit Only Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, RX/Exit Only	LD 55 PE8510 EO	US32D	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
No entry when locked. Free egress at all times.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 6.0

Doors: A105h

Description: Exterior Aluminum - Panic Egress - Access Control Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Elec Rim Exit Device, EL/RX/NL Pull	LD 55 56 64 PE8504 862	US32D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Threshold	253x3AFG FHSL14SS		PE
1	Access Control Reader	By Security Contractor		OT
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU

1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
Entry by valid input at reader to retract latch or manual key. Free egress at all times.
Push / Pull operation as needed by timed unlock via access control system.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 7.0

Doors: A105g

Description: Exterior Aluminum - Panic Egress - Exit Only Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, RX/Exit Only	LD 55 PE8510 EO	US32D	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Threshold	253x3AFG FHSL14SS		PE
1	Wiring Harness Frame	QC-C3000P		MK
1	Wiring Harness Door	QC-Cx00 for door width		MK
1	Door Position Switch	DPS-M-GY		SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
No entry. Free egress at all times.
Door position switch to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 8.0

Doors: A106a

Description: Exterior HM - Panic Egress - Classroom Security Function

3	HW Hinge	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, RX/Locking Lever x Indicator	LD 49 55 64 PE8816 WEL	US32D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Kick Plate	K1050 10" HGT x BEV x CSK	US32D	RO
1	Rain Guard	346C		PE
1	Perimeter Gasketing	303APK TKSP		PE
1	Sweep	345APK TKSP		PE

1 Threshold	253x3AFG FHSL14SS		PE
1 Wiring Harness Frame	QC-C3000P		MK
1 Wiring Harness Door	QC-Cx00 for door width		MK
1 Door Position Switch	DPS-M-GY		SU

Notes:
Entry by manual key when locked. Free egress at all times.
Exterior lever trim can be locked/unlocked from interior with key. Interior indicator shows locking status.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 9.0

Doors: A106c, A119a, A120b

Description: Exterior HM - Panic Egress - NL Function x Pull

3 HW Hinge	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Electric Power Transfer	EL-CEPT	630	SU
1 Rim Exit Device, RX/NL Pull	LD 55 64 PE8804 FSL	US32D	SA
1 Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1 Closer w/ Stop	CPS7500	689	NO
1 Kick Plate	K1050 10" HGT x BEV x CSK	US32D	RO
1 Rain Guard	346C		PE
1 Perimeter Gasketing	303APK TKSP		PE
1 Sweep	345APK TKSP		PE
1 Threshold	253x3AFG FHSL14SS		PE
1 Wiring Harness Frame	QC-C3000P		MK
1 Wiring Harness Door	QC-Cx00 for door width		MK
1 Door Position Switch	DPS-M-GY		SU

Notes:
Entry by manual key only. Free egress at all times.
Door contact to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 10.0

Doors: A101a

Description: Aluminum - Panic Pgress Pair - Active Leaf - Lockable Push / Pull Function x Future Access Control

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Elec CVR Exit Device, EL/RX/CD/NL Pull	NB 16 55 56 64 ADPE8610 P106 x 862	US32D	SA

2	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop & Hold-Open	CPS7500T	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Interior Threshold	271A FHSL14SS		PE
2	Wiring Harness Frame	QC-C3000P		MK
2	Wiring Harness Door	QC-Cx00 for door width		MK
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes: Size threshold for pair of doors.
Entry by manual key when locked. Free egress at all times.
Push / Pull operation as needed by exit device dogging with keyed lock cylinder in panic bar.
Hardware set includes electronic exit device and power transfer components for future access control upgrade.
Coordinate with electrical and security contractors.

Set: 11.0

Doors: A101b

Description: Aluminum - Panic Pgress Pair - Inactive Leaf - Lockable Push / Pull Function

1	Continuous Hinge	CFMxxSL-HD1 for door hgt		PE
1	CVR Exit Device, CD/DT Pull	NB 16 64 ADPE8610 862	US32D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop & Hold-Open	CPS7500T	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
No entry when locked. Free egress at all times.
Push / Pull operation as needed by exit device dogging with keyed lock cylinder in panic bar.

Set: 12.0

Doors: A105a

Description: Aluminum - Panic Egress - Access Control Function

1	Continuous Hinge	CFMxxSL-HD1 PT for door hgt		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Elec Rim Exit Device, EL/CD/NL Pull	16 56 64 PE8504 862	US32D	SA
2	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO

1	Access Control Reader	By Security Contractor	OT
1	Wiring Harness Frame	QC-C3000P	MK
1	Wiring Harness Door	QC-Cx00 for door width	MK
1	Door Position Switch	DPS-M-GY	SU
1	Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)	SU
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.	OT

Notes:
Entry by valid input at reader to retract latch or manual key. Free egress at all times.
Push / Pull operation as needed by timed unlock via access control system or exit device dogging with lock cylinder in panic bar.
Coordinate with electrical and security contractors.

Set: 13.0

Doors: A105b

Description: Aluminum - Panic Egress - Locking Push / Pull Function

1	Continuous Hinge	CFMxxSL-HD1 for door hgt		PE
1	Rim Exit Device, CD/DT Pull	16 64 PE8510 862	US32D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO
1	Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
No entry when locked. Free egress at all times.
Push/Pull operation as needed by exit device dogging with lock cylinder in panic bar.
Coordinate with electrical and security contractors.

Set: 14.0

Doors: A105f

Description: Aluminum - Access Control Function x Closer w/ Stop

1	Continuous Hinge	CFMxxSL-HD1 for door hgt		PE
1	Storeroom Lock (ALSF)	20 64 10XG04 LL	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Electric Strike	5000C	630	HS
1	Bridge Rectifier	2005M3		HS
1	Closer w/ Stop	CPS7500	689	NO
1	Closer Stop Spacer	6891	689	NO
1	Closer Mtg Plate	7788 as req'd	689	NO

1 Access Control Reader	By Security Contractor		OT
1 Wiring Harness Frame	QC-C3000P		MK
1 Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU
1 Seals, Sweeps & Astragal	By Aluminum Door Mfr.		OT

Notes:
Entry to Weight Room by valid input at reader to release electric strike or manual key.
Free egress at all times.
Coordinate with electrical and security contractors.

Set: 15.0

Doors: A202a

Description: Access Control Function x Closer

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lock	64 10XG04 LL	US26D	SA
1 Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1 Electric Strike	5000C	630	HS
1 Bridge Rectifier	2005M3		HS
1 Closer	7500/PR7500 as req'd	689	NO
1 Door Stop	400 series as req'd	US26D	RO
3 Silencer	608/609		RO
1 Access Control Reader	By Security Contractor		OT
1 Wiring Harness Frame	QC-C3000P		MK
1 Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU

Notes:
Entry when locked by valid credential to reader to release electric strike or manual key.
Free egress at all times.
Coordinate with electrical and security contractors.

Set: 16.0

Doors: A103

Description: Access Control Function

3 Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lock	64 10XG04 LL	US26D	SA
1 Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1 Electric Strike	5000C	630	HS
1 Bridge Rectifier	2005M3		HS
1 Door Stop	400 series as req'd	US26D	RO

3 Silencer	608/609		RO
1 Access Control Reader	By Security Contractor		OT
1 Wiring Harness Frame	QC-C3000P		MK
1 Power Supply (Consolidate)	AQ Series (coordinate qtys & options with Security Contractor)		SU

Notes:
Entry by valid input at reader to release electric strike or manual key. Free egress at all times. Coordinate with electrical and security contractors.

Set: 17.0

Doors: A118a, A121, A203
Description: Storeroom Function Pair - Outswing

6 Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Flush Bolt	555/557 for door type	US26D	RO
1 Storeroom Lock	64 10XG04 LL	US26D	SA
1 Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
2 Door Stop	400 series as req'd	US26D	RO
2 Silencer	608/609		RO

Set: 18.0

Doors: A118b
Description: Storeroom Function Pair - Inswing

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Flush Bolt	555/557 for door type	US26D	RO
1 Storeroom Lock	64 10XG04 LL	US26D	SA
1 Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
2 Door Stop	400 series as req'd	US26D	RO
2 Silencer	608/609		RO

Set: 19.0

Doors: A104, A115
Description: Storeroom Function x Closer

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lock	64 10XG04 LL	US26D	SA
1 Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1 Closer	7500/PR7500 as req'd	689	NO
1 Door Stop	400 series as req'd	US26D	RO
3 Silencer	608/609		RO

Set: 20.0

Doors: A105j, A107b
Description: Storeroom Function x Overhead Stop

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	64 10XG04 LL	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Conc Overhead Stop	1-336	652	RF
1	Interior Threshold	271A FHSL14SS		PE
3	Silencer	608/609		RO

Notes: Entry to Weight Room by key only. Free egress fo Field at all times

Set: 21.0

Doors: A116, A117
Description: Storeroom Function

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	64 10XG04 LL	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Door Stop	400 series as req'd	US26D	RO
3	Silencer	608/609		RO

Set: 22.0

Doors: A102
Description: Office Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Entry/Office Lock	64 10XG05 LL	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Door Stop	400 series as req'd	US26D	RO
3	Silencer	608/609		RO
1	Coat Hook	RM828	US32D	RO

Set: 23.0

Doors: A108, A109
Description: Privacy Function w/ Indicator x Closer

3	Hinge	TA2314 4-1/2" x 4-1/2"	US26D	MK
1	Privacy Lock w/ Indicator	V20 8265 LNL	US26D	SA

1	Closer	7500/PR7500 as req'd	689	NO
1	Kick Plate	K1050 10" HGT x BEV x CSK	US32D	RO
1	Door Stop	400 series as req'd	US26D	RO
3	Silencer	608/609		RO
1	Coat Hook	RM828	US32D	RO

Set: 24.0

Doors: A114
Description: Push / Pull Function - Lockable

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Public Toilet Deadlock	64 4878	US26D	SA
1	Permanent IC Core	6300 SC (Schlage C keyway)	US15	SA
1	Pull Plate	BF 123x70C CFTT/CFC as req'd	US32D	RO
1	Push Plate	70E CFTT/CFC as req'd	US32D	RO
1	Closer	7500/PR7500 as req'd	689	NO
1	Kick Plate	K1050 10" HGT x BEV x CSK	US32D	RO
1	Door Stop	400 series as req'd	US26D	RO
1	Interior Threshold	271A FHSL14SS		PE
3	Silencer	608/609		RO

Set: 25.0

Doors: A110a, A110b, A112a, A112b
Description: Push / Pull Function - Restrooms

3	Hinge	TA2314 4-1/2" x 4-1/2"	US26D	MK
1	Pull Plate	BF 123x70C	US32D	RO
1	Push Plate	70E	US32D	RO
1	Closer	7500/PR7500 as req'd	689	NO
1	Kick Plate	K1050 10" HGT x BEV x CSK	US32D	RO
1	Door Stop	400 series as req'd	US26D	RO
3	Silencer	608/609		RO

Set: 26.0

Doors: A105c, A105d, A106b, A107a, A119b, A120c, A202b
Description: Miscellaneous Doors

1	All Hardware	By Door System Mfr.		OT

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glass-Based Light Diffusing Insulating Glazing Units (TGUs)

C. Glazing units.

D. Plastic films.

E. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

C. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.

D. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

E. Section 08 44 13 - Glazed Aluminum Curtain Walls: Glazing furnished as part of wall assembly.

F. Section 08 51 13 - Aluminum Windows: Glazing furnished by window manufacturer.

G. Section 08 83 00 - Mirrors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

D. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

F. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

G. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

J. GANA (GM) - GANA Glazing Manual; 2022.

K. GANA (SM) - GANA Sealant Manual; 2008.

L. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

M. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

P. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

Q. UL 972 - Standard for Burglary Resisting Glazing Material; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting two weeks before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - 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, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch in sizeof glass units.

E. Certificates: Certify that products meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), and GANA (LGRM) for glazing installation methods. Maintain one copy on site.

B. Provide labels showing glass manufacturer's , type of glass, thickness, and quality. Labels shall remain on glass until it has been se an approved by the Architect.

C. Thermal Performance Properties:
   1. Solar Heat Gain Coefficient : NFCR 200 <= 0.40.

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

1.07 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.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

D. Polycarbonate Sheet Glazing: Provide a one (1) year manufacturer warranty to include coverage for breakage, coating failure, abrasion resistance, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. AGC Glass North Americawww.agcglass.com
   2. Cardinal Glass Industries, www.cardinalcorp.com
   3. GGI - General Glass International: www.generalglass.com/
   4. Guardian Glass, LLC, www.guardianglass.com
   5. JE Berkowitz, LP: www.jeberkowitz.com/
   6. Pilkington North America, www.pilkington.com
   7. Standard Bent Glass Corp: www.standardbent.com/
   8. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/
   9. Viracon, Inc: www.viracon.com/
   10. Vitro Architectural Glass, www.vitroglazing.com
   11. Substitutions: See Section 01 60 00 - Product Requirements.

B. Translucent Glazing Unit Manufacturers:
   1. Advanced Glazings Limited, P.O. Box 1460 Station "A" , Sydney, N.S. Canada, B1P 6R7, phone (902)794-2899, email info@advancedglazings.com

C. Plastic Films Manufacturers:
   1. 3M Window Film; ____: solutions.3m.com/wps/portal/3M/en_US/Window_Film/Solutions/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.

B. 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 exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.

1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
2. Polyvinyl Butyral (PVB) Interlayer: 0.060 inch thick, minimum.

2.04 TRANSLUCENT GLAZING UNITS (TGU)

A. TGU Design and Appearance:
1. The Translucent Glazing Unit shall be of a design such as to present a monolithic glass section without visible internal framing, support or other solid member inside of the perimeter spacer. The ability to use nearly any type or manufacture of architectural flat glass shall enable the visual integration of translucent surfaces with those of nearby vision glass as well as ensuring that the appearance of the translucent glazing surfaces does not deteriorate over the life of the building. The employment of separate technologies for thermal insulation and light diffusion shall be such as to ensure that different thermal insulation specifications do not affect light transmission.

B. TGU Description:
1. Air filled preassembled units consisting of:
   a. Two lites of glass;
   b. Honeycomb transparent insulation core aligned perpendicular to glazing, for TGU thermal insulation;
   c. Translucent, non-woven veils permanently bonded to internal glass surfaces;
   d. Continuous perimeter metal spacer bar separated from glass surfaces with foam thermal break;
   e. Glass lites connected together with spacer bar using structural silicone sealant.
   f. Airspace within TGU filled with air pressure equalized to atmospheric pressure with stainless steel capillary pressure equalization (vent) tube.
   g. Glazing unit shall not contain in excess of .01 parts per million by weight each of Volatile Organic Compounds, asbestos, resorcinol-formaldehyde, pheono-resorcinol formaldehyde, urea formaldehyde, CFC, HFC, HCFC, Halon, Benzene, Cadmium (and compounds, Carbon tetrachloride, Cyanide (and compounds) Toluene, Xylenes, Lead. 1,1,1,Trichlorethane, Trichlorethylene, MEK, and MIK
2. Overall thickness and size:
   a. Thickness: 1/2" plus glass lites.
   b. Maximum overall size, edge of glass: 60" x 144" (1524mm X 3658mm)
3. Frame Compatibility: Solera S R3.
4. TGU performance
   a. Thermal insulation (U-value): 0.33 (Btu/hr·ft²·°F)
   b. Daylight transmittance: 31 %
   c. Light Diffusion Power (LDP): moderate
   d. Daylight to solar heat gain ratio: LSG=0.88
   e. Solar heat gain coefficient (no shade): SHGC=0.35
   f. Sound transmittance class (STC) (ASTM E 70-97): 35
   g. Maximum color shift: [2 Δ E] over 10 years.
   h. Flame spread (ASTM E 84-05e1): 5.
   i. Smoke developed (ASTM E 84-054e1): 10.
   j. Spacer resistance to crushing: 500 lbs/lineal Ft.

C. Glass:
1. Outboard lite: 6mm tempered Standard Gray as noted below.
2. Inboard lite: 4mm/.060PVB/4mm tempered Clear

D. Veil set:

1. AGL401 exterior, AGL401 interior

E. Capillary pressure equalization (vent) tube: stainless steel, diameter to allow for pressure equalization while also preventing uptake of particulate matter.

F. Daylighting study: Visible light transmittance shall be as agreed upon between the Architect and the manufacturer and will be based on "Radiance" studies as provided by the manufacturer as a part of this work. Studies will demonstrate the improvement of light distribution and light levels from the use of diffuse light from translucent glazings. Study will include modelling results of light levels throughout the space to be analyzed. (Radiance is a program developed by Lawrence Berkeley National Laboratory.)

G. ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES
   1. General: Provide products of type indicated and complying with following requirements:
      a. Glazing sealants and glazing tapes: to glazing frame manufacturer's standards.
      b. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
      c. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
      d. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920-05 requirements, including those for Type, Grade, Class and Uses.
      e. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Owner's Representative from manufacturer's standard colors.

H. MISCELLANEOUS GLAZING MATERIALS
   1. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.
   2. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
   3. Setting Blocks, Spacers: must be compatible with TGU sealant.

2.05 INSULATING / EXTERIOR GLASS UNITS

A. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Spacer Color: Black.
   4. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
      b. Color: Black.
   5. Purge interpane space with dry air, hermetically sealed.

B. EG-1: Insulating Glass Units: Vision glass, double glazed.
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Space between lites filled with argon.
   3. Outboard Lite: Outboard lite: 6mm tempered Standard Gray as noted below.
      a. Tint: Gray.
      b. Coating: Low-E (solar control type), on #2 surface.

1) Vitro Architectural Glass; Solarban 70
2) Substitutions; See Section 01 60 00 - Product Requirements

4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, nominal.
7. Visible Light Transmittance (VLT): 32 percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): 19 percent, nominal.
9. Glazing Method: Dry glazing method, gasket glazing.

C. EG-2 : Insulating Glass Units: Translucent - Solera
1. Applications: Ribbon Windows as noted on the drawings..
2. Space between lites filled with Honeycomb transparent insulation core.
3. Outboard Lite: 6mm tempered Standard Gray as noted below.
   a. Tint: Gray.
4. Veil Set: AGL401 exterior, AGL401 interior
   a. Solera
5. Spacer Bar.
   a. Solera-R5
6. Inboard Lite: Laminated Glass 4mm/.060PVB/4mm tempered Clear
   a. Tint: Clear.
7. Total Thickness: 1 inch.

D. EG-3: Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior Sectional Garage doors and where indicated on drawings. .
2. Space between lites filled with argon.
3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
   a. Coating: Low-E (solar control type), on #2 surface.
      1) Vitro Architectural Glass; Solarban 70
      2) Substitutions; See Section 01 60 00 - Product Requirements
4. Inboard Lite: Laminated Glass 4mm/.060PVB/4mm tempered Clear
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, nominal.
7. Visible Light Transmittance (VLT): 32 percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): 19 percent, nominal.
9. Glazing Method: Dry glazing method, gasket glazing.

E. EG-4: Insulating Glass Units: Bullet Resistant Glazing, double glazed. (Film Applied)
1. Applications: Locker Room Building as indicated on drawings..
2. Space between lites filled with argon.
3. Outboard Lite: Fully Tempered float glass, 1/4 inch thick, mininum
   a. Tint: Gray.
   b. Coating: Low-E (solar control type), on #2 surface.
      1) Vitro Architectural Glass; Solarban 70
      2) Substitutions; See Section01 60 00-Product Requirements
4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum
   a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, nominal.
7. Visible Light Transmittance (VLT): 32 percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): 19 percent, nominal.

9. Glazing Method: Dry glazing method, gasket glazing.
10. Accessories:
    a. Bulllet resistant Plastic Film - 3M Window, Level 3 Film on all panes of storefront

2.06 GLAZING UNITS

A. G-1: Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.

B. G-2: Security Glazing: Laminated glass, 2-Ply.
   1. Applications: Locations as indicated on drawings.
   2. Tint: Clear.
   3. Thickness: 1/4 inch.
   4. Outer Lite: Tempered glass.
   5. Interlayer: Polyvinyl butyral (PVB), 0.030 inch thickness
   6. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
   7. Inside Lite: Tempered glass.
   8. Performance Criteria:
      a. Burglary Resistance: Pass UL 972 tests in compliance with level of burglary and forced-entry resistance indicated; Multiple Impact.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

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 INSTALLATION - PRESSURE GLAZED SYSTEMS

A. Application - Exterior Glazed: Set glazing infills from exterior side of 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 pressure plates without displacing glazing gasket; exert pressure for full continuous contact.

3.06 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.07 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove non-permanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. 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.

3.08 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 08 80 00

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile.
   2. Carpet tile.

B. Removal of existing floor coverings.

C. Preparation of existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

F. Patching compound.

G. Remedial floor coatings.

H. Remedial floor sheet membrane.

I. Preparation of new and existing wood-based floors and subfloors for installation of new floor coverings.

1.02 RELATED REQUIREMENTS

A. Section 01 23 00 - Alternates: Bid pricing for remediation treatments if required.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

E. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; October 2011.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.

2. Manufacturer's required bond/compatibility test procedure.

C. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.

D. Testing Agency's Report:
1. Description of areas tested; include floor plans and photographs if helpful.
2. Summary of conditions encountered.
3. Moisture and alkalinity (pH) test reports.
4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Product data for recommended remedial coating.
7. Submit report directly to Owner.
8. Submit report not more than two business days after conclusion of testing.

E. Adhesive Bond and Compatibility Test Report.

F. Copy of RFCI (RWP).

1.06 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
3. Products:
a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#

b. H.B. Fuller Construction Products, Inc; TEC Feather Edge Skim Coat: www.tecspecialty.com/
c. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch: www.usg.com/
d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
2. Use product recommended by testing agency.
3. Products:
a. Allied Construction Technologies, Inc; _____: www.actechperforms.com/#sle.
b. ARDEX Engineered Cements; ARDEX MC RAPID: www.ardexamericas.com/#sle.
c. AVECS, LLC; RE-ACT: www.avecs.build/#sle.
d. Crown Polymers, a division of American Polymers Corporation; CrownShield 8303 MVB: www.crownpolymers.com/#sle.
e. Custom Building Products; TechMVC Moisture Vapor and Alkalinity Barrier: www.custombuildingproducts.com/#sle.
f. Floor Seal Technology, Inc; MES 100 with Floor Seal FloorCem SLU: www.floorseal.com/#sle.
g. GCP Applied Technologies; Kovara AB 300: www.gcpat.com/#sle.
h. H.B. Fuller Construction Products, Inc; TEC LiquiDam with TEC Level Set 200 SLU: www.tecspecialty.com/#sle.
i. Koster American Corporation; _____: www.kosterusa.com/#sle.
j. LATICRETE International, Inc; LATICRETE NXT Vapor Reduction Coating with LATICRETE NXT Level Plus: www.laticrete.com/#sle.
k. LATICRETE International, Inc; LATICRETE SUPERCAP Moisture Vapor Control with LATICRETE SUPERCAP Underlayment: www.laticrete.com/#sle.
l. Sika Corporation; Sikafloor Moisture Tolerance Epoxy Primer and Sikafloor Self-Leveling Moisture Tolerant Resurfacer: www.sikafloorusa.com/#sle.
m. Tnemec Company, Inc; Series 208 Epoxoprime MVT: www.tnemec.com/#sle.
n. Substitutions: See Section 01 60 00 - Product Requirements.

D. Remedial Floor Sheet Membrane: Pre-formed multi-ply sheet membrane installed over concrete subfloor and intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
1. Thickness: 28 mil (0.028 inch).
2. Tape: Types recommended by underlayment manufacturer to install membrane and cover seams.
3. Products:
a. GCP Applied Technologies; Kovara MBX: www.gcpat.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
      a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
   2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
      a. Do not attempt to remove coating or penetrating material.
      b. Do not abrade surface.
   3. Preliminary cleaning.
   4. Removal of all existing adhesive or fasteners in preparation to receive new flooring
   5. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
   6. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   7. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   8. Specified remediation, if required.
   9. Patching, smoothing, and leveling, as required.
   10. Removal of all existing adhesive or fasteners in preparation to receive new flooring
   11. Other preparation specified.
   12. Adhesive bond and compatibility test.
   13. Protection.

B. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
   3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.05 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.

C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.06 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.07 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.08 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.09 INSTALLATION OF REMEDIAL FLOOR SHEET MEMBRANE

A. Install in accordance with sheet membrane manufacturer's instructions.

3.10 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION 09 05 61

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Gypsum sheathing.

C. Gypsum wallboard.

D. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 41 00 - Structural Metal Stud Framing: Exterior wind-load-bearing metal stud framing.

B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 21 16 - Blanket Insulation: Acoustical Insulation.

D. Section 07 84 00 - Firestopping: Top-of-wall assemblies at fire rated walls.

E. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps.

F. Section 09 22 16 - Non-Structural Metal Framing.

G. Section 09 91 23 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.

D. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

E. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018.

F. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

G. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2019.

H. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

J. ASTM E413 - Classification for Rating Sound Insulation; 2022.

K. GA-216 - Application and Finishing of Gypsum Panel Products; 2016, with Errata.

L. GA-600 - Fire Resistance Design Manual; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. See Section 01 6116 VOC Content Restrictions, for VOC submittal procedures

C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

D. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

E. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

A. Perform in accordance with ASTM C840. Comply with requirements of GA-600 for fire-rated assemblies.

B. Refer to "Recommended Specification on Levels of Gypsum Board Finish" as published by the Gypsum Association (and AWCI/CISCA/PDCA) for finish levels required.

C. Recommended deflection limit for gypsum board assemblies is L/240.
   1. Tile finishes applied to cementitious backer units will require deflection limits of L/360 or less.

1.06 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever is more stringent.

B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to dry joint treatment materials.

D. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

E. If the application of gypsum board and gypsum shaft wall liner starts prior to the building being made weather-tight, the gypsum wallboard and/ or shaft wall liner specified shall be changed to glass-mat interior gypsum board and/ or glass mat gypsum shaft wall liner

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
   1. See PART 3 for finishing requirements.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 50-54 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 STRUCTURAL METAL FRAMING MATERIALS

A. Refer to Section 05 41 00 - Structural Metal Stud Framing

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. Georgia-Pacific Gypsum: www.gpgypsum.com.
   4. National Gypsum Company: www.nationalgypsum.com.
   5. PABCO Gypsum: www.pabcogypsum.com.
   6. USG Corporation: www.usg.com.

7. Substitutions: See Section 01 60 00 - 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. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold resistant board is required at all locations.
   3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
      c. Edges: Tapered
      d. Multi-Layer Assemblies: Thicknesses as indicated on drawings.

C. Impact Resistant Wallboard:
   1. Application: To be installed from finished floor up to 8 feet in all areas or wall areas exposed to public.
      a. Not required in stacked wall assemblies or above ceiling applications
   2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
   4. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   5. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
   6. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   7. Paper-Faced Type: Gypsum wallboard as defined in ASTM C1396/C1396M.
   8. Type: Fire resistance rated Type X, UL or WH listed.
   9. Thickness: 5/8 inch.
   10. Edges: Tapered.
   11. Paper-Faced Products:
      a. American Gypsum Company; M-Bloc IR Type X.
      b. CertainTeed Corporation; Extreme Impact Resistant Drywall with M2Tech.
      c. National Gypsum Company; Gold Bond XP Hi-Impact XP Gypsum Board.
      d. PABCO Gypsum; Impact Resistant Type X.
      e. USG; USG Sheetrock Brand Mold Tough VHI Firecode X Panels.
      f. Substitutions: See Section 01 60 00 - Product Requirements.

D. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
   1. Application: Exterior sheathing, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
   4. Core Type: Type X.
   5. Type X Thickness: 5/8 inch.
   6. Edges: Square.
   7. Glass Mat Faced Products:
      a. American Gypsum Company; M-Glass Exterior Sheathing Type X.
      b. CertainTeed Corporation; GlasRoc Type X Exterior Sheathing.
      c. Georgia-Pacific Gypsum; DensGlass Fireguard Sheathing.
      d. National Gypsum Company; Gold Bond eXP Fire-Shield Sheathing.

e. PABCO Gypsum; Glass Sheathing Type X.
f. USG; USG Securock Brand Ultra Glass-Mat Sheathing Firecode X.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; friction fit type, unfaced.
1. Refer to Section 07 21 16.

B. Reveal Moldings:
1. Manufacturer: Fry Reglet Corporation, Alpharetta, GA
a. Products: Drywall F Reveal
b. Color: Selected by architect from manufacturers standard colors.
2. Acceptable Manufacturers
a. Gordon Inc, Shreveport, LA
b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Corner Beads: Zinc alloy. Products shall be similar to the following:
1. Marino-Ware; Product CB Corner Bead: www.marinoware.com.
2. Phillips Manufacturing Co; Product Everlast Corner Bead: www.phillipsmfg.com.
3. 103 Deluxe Bead by Clark Dietrich Building Systems
4. Substitutions: See Section 01 60 00 - Product Requirements.

D. Edge Trim: Drywall J Molding. Products shall be similar to the following:
1. Fry Reglet Corporation, Alpharett, GA
a. Products: Drywall J Molding - 5/8"
b. Color: Selected by architect from manufacturers standard colors.
2. Marino-Ware: www.marinoware.com.
3. Phillips Manufacturing Co; Product L-200 Trim: www.phillipsmfg.com.
4. Clark Dietrich Building Systems; Product Metal Trim M20B
5. Substitutions: See Section 01 60 00 - Product Requirements.

E. Expansion and Control Joints: Galvanized steel one piece with V-shaped slot and removable strip covering opening. Products shall be similar to the following:
1. Phillips Manufacturing Co; Product 093 Expansion Joint: www.phillipsmfg.com.
2. Clark Dietrich Building Systems; Product 093 Control Joining
3. Alabama Metal Industries Corporation (AMICO); Product No. 093 Drywall Control Joint
4. Substitutions: See Section 01 60 00 - Product Requirements.

F. 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.

G. Screws: ASTM C 1002; self-drilling type; cadmium-plated for exterior locations.

H. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

D. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
   1. Provide framing immediately on both sides of joint and back with 2 inches of gypsum board strips to maintain fire resistance rating.
   2. Attach to framing with screws.
   3. Use longest practical lengths.
   4. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   5. Partition, furring or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling.
   6. Ceiling abuts a structural element, dissimilar wall or partition or other vertical penetration.
   7. Construction changes within the plane of the partition or ceiling.
   8. Wings of L, U, and T shaped ceiling area are joined.

B. Corner Beads: Install at external corners, using longest practical lengths.
   1. Attach to framing with screws.

C. Edge Trim (Casing Bead): Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.05 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.
   3. Taping, filling and sanding is not required at base layer of double layer applications.

3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.07 FINISH LEVEL SCHEDULE

A. Level 1: Above finished ceilings concealed from view.
   1. All joints and interior angles shall have tape set in joint compound. Surface is to be free of excess joint compound. Tool marks and ridges acceptable.

B. Level 2: Utility areas and areas behind cabinetry.
   1. All joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surfaces shall be be free of excess joint compound. Tool marks and ridges acceptable. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound.

C. Level 3: Walls scheduled to receive textured wall finish.
   1. All joints and interior angles shall have tape embedded in joint compound and one additional coat of joint compound applied over all joints and interior angles. Fasteners heads and accessories shall be covered with two separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges.

D. Level 4: Walls and ceilings scheduled to receive flat or eggshell paint finish of wall coverings.
   1. All joints and interior angles shall have tape embedded in joint compound and two additional coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fasteners heads and accessories shall be covered with three separate coats of joint compound. The surface shall be smooth and free of tool marks and ridges.

E. Level 5: Walls and ceilings scheduled to receive semi-gloss or gloss paint finish or in areas where severe or critical lighting conditions occur.
   1. All joints and interior angles shall have tape embedded in joint compound and two additional coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fasteners heads and accessories shall be covered with three separate coats of joint compound. A thin coat (skim coat) of joint compound or a material manufactured especially for this purpose, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.
      a. Skim Coat: a thin coat of joint compound or a material manufactured especially for this purpose, applied over the entire surface to fill imperfections in the joint work. smooth the pater texture, and provide a uniform surface. Excess compound is immediately sheared off, leaving a film of skim coating compound completely covering the paper.

END OF SECTION 09 21 16

SECTION 09 22 16
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 05 51 00 - Metal Stairs: Execution requirements for anchors for attaching work of this section.

B. Section 06 10 00 - Rough Carpentry: Wood blocking within stud framing.

C. Section 07 21 13 - Board Insulation:

D. Section 09 21 16 - 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 E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

D. ASTM E413 - Classification for Rating Sound Insulation; 2022.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. CEMCO: www.cemcosteel.com.
   2. ClarkDietrich: www.clarkdietrich.com.
   3. Jaimes Industries: www.jaimesind.com.
   4. Clarkwestern Dietrich Building Systems LLC: www.clarkdeitrich.com.
   5. Marino: www.marinoware.com.
   6. R-stud, LLC: www.rstud.com.
   7. SCAFCO Corporation: www.scafco.com.
   8. Simpson Strong Tie: www.strongtie.com.
   9. Steel Construction Systems: www.steelconsystems.com.
   10. The Steel Network, Inc: www.SteelNetwork.com.
   11. State Building Products: www.statebp.com
   12. Substitutions: See Section 01 60 00 - 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 sections, minimum depth of 7/8 inch.
   5. Gauge: Unless indicated otherwise the metal stud framing shall be formed from the following gauge metal:
      a. Framing openings: 16 gauge (head and jamb).
      b. Remaining metal studs: 20 gauge
   6. Z Furring: Z- shaped sections, depth to match the thickness of rigid insulation, 20 gauge.
   7. Furring: Hat-shaped sections, minimum depth of 7/8 inch 20 gauge.
   8. Resilient Sound Isolation Clips: Steel resilient clips with molded rubber isolators, attaches to framing; improves noise isolation for areas between gypsum board assemblies and adjacent sources of noise.
   9. Steel Stud Framing Connectors:

B. Loadbearing Studs: As specified in Section 05 41 00 - Structural Metal Stud Framing

C. 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 and braced with continuous bridging on both sides.

D. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.

E. Steel Framing For Suspended Ceilings:
   1. Material: Cold rolled steel, 0.0598 inch (16 gauge) minimum thickness of base metal; galvanized in accordance with ASTM A 653, G60 hot dip galvanized coating.
   2. Ceiling Channels: C shaped 20 gauge.
   3. Carrying Channels: 1-1/2 inches deep with 7/16 inch wide flanges
   4. Furring: Hat-shaped sections, depth 7/8 inch, 16 gauge
   5. Wire Hangers: ASTM A641, Class 1 zinc coating, soft temper, 0.162 inch (8 gage).
   6. Hanger Anchorage Devices: Screws, clips, bolts, cast-in-place concrete inserts or other devices applicable to the indicated method of structural anchorage for ceiling hangers. Size devices for 3 times the calculated load supported, except size direct pullout concrete inserts for 5 times the calculated loads.
   7. Channel Bridging and Bracing: U-Channel Assembly; Base metal thickness of .0538 and minimum of 1/2 inch flanges.
   8. Flat Strap and Backing Plate: Sheet for blocking and bracing in length and width indicated:
      a. Galvanized Sheet Steel.

F. Non-Loadbearing Framing Accessories:

G. Acoustic Insulation: As specified in Section 07 21 13.

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. At partitions indicated with an acoustic rating:
   1. Provide components and install as required to produce STC rating of 50 - 54, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.
   2. Place one bead of acoustic sealant between runners and substrate , studs and adjacent construction.

E. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

F. Install studs vertically at 16 inches on center.

G. Align stud web openings horizontally.

H. Secure studs to tracks using crimping method. Do not weld.

I. Fabricate corners using a minimum of three studs.

J. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.

K. Coordinate erection of studs with requirements of door frames and window frames; install supports and attachments.

L. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

M. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and opening frames.

N. Sound Isolation Clips: Mechanically attach to framing or structure with fasteners recommended by clip manufacturer. Install at spacing indicated on drawings.

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. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.

D. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

E. 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 09 22 16

SECTION 09 25 13
ACRYLIC PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Materials and installation of exterior finish system for soffits and weather-protected areas.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Perimeter and penetration sealants.

B. Section 09 21 16 - Gypsum Board Assemblies

C. Section 09 22 16 - Non-Structural Metal Framing

1.03 REFERENCE STANDARDS

A. ASTM B 117 Method of Salt Spray (Fog) testing

B. ASTM C 150 Specification for Portland Cement

C. ASTM C 1177 Specification for Glass Mat Gypsum for Use as Sheathing

D. ASTM D 968 Test for Abrasion Resistance of Organic Coatings by Falling Abrasive

E. ASTM D 1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

F. ASTM D 3273 Test for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

G. ASTM E 84 Test Method for Surface Burning Characteristics of Building Material

H. ASTM E 119 Method for Fire Tests of Building Construction and Materials

I. ASTM E 228 Test Method for Linear Thermal Expansion of Solid Materials With a Push-Rod Dilatometer

J. ASTM E 283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

K. ASTM E 330 Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static air Pressure Difference

L. ASTM E 331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

M. ASTM E 2178 Standard Test Method for Air Permeance of Building Materials

N. ASTM G 153 Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials

O. ASTM G 154 Practice for Operating Light and Water Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Non-metallic materials

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate soffit patterns, joint details and molding profiles.

C. Product Data: Provide data on system materials and product characteristics.

D. Selection Samples: Submit manufacturer's standard range of samples illustrating available coating colors and textures.

E. Verification Samples: Submit actual samples of selected coating on specified substrate, minimum 12 inches square, illustrating project colors and textures.

F. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.

1.05 QUALITY ASSURANCE

A. Maintain copy of specified installation standard and manufacturer's installation instructions at project site at all times during installation.

B. Manufacturer Qualifications: Provide all products from the same manufacturer.

C. Installers Qualifications: Company specilaizing in this work with not less than 5 years experience and approve by the manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.

B. Protect coatings (pail products) from freezing and temperatures in excess of 90°F (32° C). Store away from direct sunlight.

1.07 FIELD CONDITIONS

A. Do not prepare materials or apply EIFS during inclement weather unless areas of installation are protected. Protect installed EIFS areas from inclement weather until dry.

B. Do not install coatings or sealants when ambient temperature is below 40 degrees F.

C. Do not leave installed insulation board exposed to sunlight for extended periods of time.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's standard material warranty, covering a period of not less than 5 years.

C. Provide separate warranty from installer covering labor for repairs or replacement for a period of not less than 2 years.

PART 2 PRODUCTS

2.01 REFER TO "FINISH MATERIAL SCHEDULE" ON SHEET A9.0 FOR MANUFACTURER INFORMATION AND MATERIAL SELECTIONS. ALSO REFERENCE OTHER A9 SERIES DRAWINGS (FINISH PLANS) FOR ADDITIONAL INFORMATION, LOCATIONS AND EXTENT OF MATERIALS.

2.02 MANUFACTURERS

A. Parex USA, Inc.: www.parex.com.

B. Sto Corp: www.stocorp.com.

C. Dryvit

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MATERIALS

A. Finish Coating Top Coat: Water-based, air curing, acrylic finish with integral color and texture.
   1. Texture: Fine.
   2. Color: As selected from manufacturer's range of standard colors.
   3. Factory Mixed

B. Base Coat: Fiber-reinforced, acrylic-based product compatible with reinforcing mesh.

C. Reinforcing Mesh--nominal 4.2 oz/yd2 (143 g/m2), flexible, symmetrical, interlaced glass fiber fabric, with alkaline resistant coating for compatibility with Sto materials

2.04 SHEATHING

A. See Section 09 21 16 - Gypsum Board Assemblies.

2.05 ACCESSORIES

A. Corner bead, casing bead, starter track, expansion and control joint accessories.

B. All accessories shall meet the requirements of ASTM C 1063.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is sound and free of oil, loose materials, or protrusions that could interfere with installation and is of a type and construction that is acceptable to manufacturer. Do not begin work until substrate and adjacent materials are complete and thoroughly dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Base Coat: Apply in thickness as necessary to fully embed reinforcing mesh, wrinkle free, including back-wrap at all terminations. Install reinforcing fabric as recommended by manufacturer.

1. Lap reinforcing mesh edges and ends a minimum of 2-1/2 inches.
2. Allow base coat to dry a minimum of 24 hours before next coating application.

C. Install expansion joints at floor lines as recommended by EIFS manufacturer.

D. Apply finish coat after base coat has dried not less than 24 hours and finish to a uniform texture and color.

E. Finish Coat Thickness: 1/16 inch.

F. Apply sealant at finish perimeter and expansion joints in accordance with Section 07 90 00 - Joint Sealants.

3.03 CLEANING

A. Clean surfaces and work areas of foreign materials resulting from operations.

3.04 PROTECTION

A. Provide protection of installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry.

B. Protect completed work from damage and soiling by subsequent work.

END OF SECTION 09 25 13

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Division 21 - Fire Suppression Sprinklers: Sprinkler heads in ceiling system.

B. Division 23 - Air Outlets and Inlets: Air diffusion devices in ceiling.

C. Division 26 - Interior Luminaires: Light fixtures in ceiling system.

D. Division 27 - Public Address and Music Equipment: Speakers in ceiling system.

E. Division 28 - Fire Alarm System: Fire alarm components in ceiling system.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

1.04 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.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples 6x6 in size illustrating material and finish of acoustical units.

1.06 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.

1.07 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.

1.08 EXTRA MATERIALS

A. See Section 01 60 00 - Product Requirements, for additional provisions.

B. Maintenance Stock: Provide 1 (one) percent of total acoustical unit area of each type of acoustical unit for Owner's use in maintenance of project. This extra material is NOT to be used for any repair or replacement required during the construction period.

C. Replacement Stock: In addition to the maintenance stock, provide 1 (one) percent replacement stock of total acoustical unit area of each type of acoustical unit. Replacement Stock is to be

used to replace damaged materials during a 60 (sixty) day period following Substantial Completion when the responsible party for the damage cannot be determined. Remaining replacement stock is to turn over to the owner.

D. Obtain Owner's signature acknowledging receipt of extra stock.

PART 2 PRODUCTS

2.01 REFER TO "FINISH MATERIAL SCHEDULE" ON SHEET A9.0 FOR MANUFACTURER INFORMATION AND MATERIAL SELECTIONS. ALSO REFERENCE OTHER A9 SERIES DRAWINGS (FINISH PLANS) FOR ADDITIONAL INFORMATION, LOCATIONS AND EXTENT OF MATERIALS.

2.02 ACOUSTICAL UNITS

A. Manufacturers:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. USG: www.usg.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SUSPENSION SYSTEM(S)

A. Manufacturers:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. Chicago Metallic Corporation: www.chicagometallic.com.
   4. USG: www.usg.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

C. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; heavy-duty.
   1. Profile: Tee; 15/16 inch wide face.
   2. Construction: Double web.
   3. Wire: ASTM A641, Class 1 zinc coating, soft temper 0.162 inch (8 gauge)
   4. Finish: Painted, color as selected, or as noted on A9 - Material Finish Schedule.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12-gage 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.
   1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
   2. At concrete masonry bullnose corners: Provide bullnose corner cover at same elevation as face of grid.
   3. Reveal Edge: Provide classic axiom straight trim with nominal 4 inch profile.
   4. Vertical Moldings: Provide 'F' molding at top and bottom edges of ceiling tile. Anchor molding to ceiling suspension system.

D. Hold Down Clips: Compatible with ceiling grid
   1. Provide hold-down clips within 20 feet of the exterior door(s).
   2. Vestibules
   3. Toilet Rooms.

4. Locker Rooms.
5. In other spaces as shown on the drawings.

E. Rough Suspension Material
1. Metal Channel Runners: 1 1/2 inch and 3/4 inch
2. Hanger Wire: #12 galvanized soft anneal steel or 3/16 inch diameter threaded rod
3. Tie Wire: #18 galvanized anneal steel.

F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Use longest practical lengths.

E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

F. 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.

G. Hang suspension system from the building structure (structural steel and joist).
1. Do not hang suspension system from metal deck.
2. Do not hang suspension system from joist bridging.

H. 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.

I. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

J. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

K. Do not eccentrically load system or induce rotation of runners.

L. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Use longest practical lengths.
2. Overlap 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.
   2. Double cut and field paint exposed reveal edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Install hold-down clips on panels within 20 feet of exterior doors.

END OF SECTION 09 51 00

SECTION 09 62 53
SYNTHETIC TURF FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Synthetic turf flooring.

B. Synthetic turf infill.

C. Shock absorbing course.

D. Field graphics.

E. Adhesive.

1.02 REFERENCE STANDARDS

A. ASTM D1335 - Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings; 2021.

B. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2006 (Reapproved 2011).

C. ASTM D5823 - Standard Test Method for Tuft Height of Pile Floor Coverings; 2019.

D. ASTM D6662 - Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards; 2013.

E. ASTM F1936 - Standard Specification for Impact Attenuation of Turf Playing Systems as Measured in the Field; 2010 (Reapproved 2015).

F. ASTM F2765 - Standard Specification for Total Lead Content in Synthetic Turf Fibers; 2014 (Reapproved 2021).

G. NCAA (SO) - Men's and Women's Soccer Rules; current edition.

H. NFHS (Guide) - Court and Field Diagram Guide; current edition.

I. STC (PQGSP) - Performance and Quality Guidelines For Shock Pads; 2020.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate materials of construction, compliance with specified standards, installation procedures, and safety limitations.

C. Shop Drawings:
   1. Field Graphics:
      a. Indicate layout of field graphics.
      b. Indicate width of field lines.
      c. Indicate team logo.

D. Samples:
   1. Synthetic Turf Flooring: Two 12 inch by 12 inch (305 mm by 305 mm) pieces of each color and texture specified.
   2. Infill Material: One half-gallon bags of each type.
   3. Shock Absorbing Material: One half-gallon bags for each type.
   4. Field Graphics Synthetic Turf Flooring: Two 12 inch by 12 inch (305 mm by 305 mm) pieces of each color indicated on drawings.

E. Maintenance contract.

F. Manufacturer's field report.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:

1.04 QUALITY ASSURANCE

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

B. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions, erection drawings, shop drawings, and reference standard documents containing execution requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store synthetic turf flooring to project site complying with manufacturer's recommendations.

B. Store materials in a dry, covered area elevated above grade.

1.06 FIELD CONDITIONS

A. Required Ambient Conditions:
   1. Temperature: Above 45 degrees F.
   2. Relative Humidity: Not more than adhesive manufacturer's requirements.
   3. Substrate Surface: Dry.
   4. Substrate Temperature: Not less than 65 degrees F.

B. Maintain ambient conditions during installation and for 48 hours afterward.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5 year minimum manufacturer warranty for excessive wear, fiber tensile strength, deterioration or fading from UV light, seam integrity, and shock absorption. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The Motz Group; https://themotzgroup.com/

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SYNTHETIC TURF FLOORING

A. Basis of Design:
   1. Turf: 24/Seven Turf System - 1.625" slit film synthetic turf
   2. Infill: Envirofill (Microban®-infused coated quartz)
   3. Shock Pad: 20mm Schmitz ProPlay (closed-cell polypropylene)

B. Yarn fibers tufted through and adhered to a porous fiber backing:
   1. Primary Blades:
      a. Fibers: Slit-Film.
      b. Material: Polyethylene.
      c. Weight: 46 oz/sq yd minimum.
      d. Height: 1.625; comply with ASTM D5823.
      e. Tuft Bind: less than 10 lbf without infill; comply with ASTM D1335.
      f. Color: Field Green and Lime Green as indicated on drawings.
   2. Backing:
      a. First: Single layer of 8 oz. Ultraloc treated with UV inhibitors.
      b. Second: Coating of 20 oz. polyurethane.
      c. Backing Weight: 20 oz/sq yd minimum.
   3. Lead Content: 100 ppm, maximum; comply with ASTM F2765.

4. Roll: 10 feet wide, minimum.
5. Noncombustible: Pass ASTM D2859 for flammability.

C. Field Graphics:
1. Inlaid Marking: Synthetic turf of the same manufacturer in colors indicated on drawings.
2. Comply with NFHS (Guide).
3. Comply with NCAA (SO).

D. Synthetic Turf Infill: 7 psf, Envirofill (Microban®-infused coated quartz)

E. Shock Absorbing Course:
1. Impact Mats: Comply with STC (PQGSP).
a. Schmitz Pro Play - Closed Cell Polypropylene
b. Prefabricated High performance shock and drainage pad: Thermal bonded cross-linked polyethylene XLPE foam.
1) Tile Size: 7.51 ft by 3.08 ft
2) Tile Thickness:20 mm

F. Adhesive: Compatible with synthetic turf flooring and substrate.

G. Granular Fill Base: It is the responsibility of the turf installer to provide and laser screed the aggregate base.
1. Granular Fill elevation to be determined based on turf system. Turf infill is to be flush with adjacent concrete with finish rubber floor. Coordinate heights with all disciplines.

2.03 MEZZANINE TURF FLOORING

A. Basis of Design: Elevate 28 376SG - Motz Group
1. Fiber Type: Nylon
2. Fiber Mass: 4,400 denier
3. Tufted Pile Height: 0.5 in
4. Turf Blade Color: Green
5. Tufting Gauge: 3/16 in
6. Total Weight: 55 oz/sq yd
7. Min. Roll Width: 15ft
8. Min. Roll Length: Width of Building

2.04 MATERIALS

A. Edge Anchor: Wood-polymer composite lumber complying with ASTM D6662; factory finished, free of sharp vertical edges, protruding elements, and trip hazards, capable of being secured to the border.
1. Minimum Edge Radius: 1/2 inch.

B. Border: Permanent element surrounding edge anchoring, consisting of thresholds, transition strips, and walls.

PART 3 EXECUTION

3.01 EXAMINATION

A. Measure the location of synthetic grass elements, including access and egress points, hard surfaces, perimeter of existing synthetic turf flooring, support for mounted equipment, and walls.

B. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive synthetic turf flooring.

C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesives to subfloor surfaces.

3.02 PREPARATION

A. Protection of In-Place Conditions: Doors and Walls.

B. Lay out project perimeter as indicated on drawings prior to starting work.

C. Measure the location of synthetic turf elements, including access and egress points and seams.

D. Level protrusions greater than 1/32 inch high.

3.03 SHOCK ABSORBING COURSE

A. Impact Mats:
   1. Prefabricated Cushion:
      a. Lay tile with cut end tiles of equal width.
      b. Bond tile to substrate with adhesive compatible with cushion and substrate.
      c. Make cutouts around equipment not more than 3/8 inch in width; remove and refit tile as required to reduce gaps.
      d. Fill and seal gaps around equipment with sealant.

3.04 EDGE ANCHORING

A. Layout nailer boards complying with shop drawings.

B. Install along perimeter of synthetic turf.
   1. Attach to border with 3/8 inch diameter stainless steel wedge anchors at 24 inches on center, maximum.

C. Set top of edging flush or recessed 1/2 inch below top of border, maximum.

3.05 SYNTHETIC TURF

A. Synthetic Turf Flooring:
   1. Unroll material in the same direction.
   2. Prevent seams from being located over impact mats.
   3. Allow synthetic turf flooring to rest for at least 24 hours after unrolling and prior to seaming.
   4. Smooth seams and edges, eliminate overlaps and gaps.

B. Seaming:
   1. Cut: Straight, with a clean and smooth edge.
   2. Method:

C. Securing: Staple synthetic turf flooring to edging 1 inch on center.

D. Field Graphics:
   1. Comply with governing body for layout markings.
   2. Comply with manufacturer's recommendations for dimensions and color patterns indicated on drawings.
   3. Inlaid Marking:

3.06 INFILL

A. Thoroughly brush synthetic turf prior to infill installation.

B. Apply after fastening, markings, and trim work are complete.

C. Apply infill uniformly in multiple lifts, brush fibers between each application.

D. Measure depth to confirm compliance with drawings.

E. Ensure infill is flush with adjacent rubber flooring

3.07 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance for additional requirements.

B. Owner or Owner's representative will inspect synthetic grass after installation to verify that surfacing is of proper type and meets specified design safety and accessibility requirements.

C. Repair or replace rejected work until compliant with specified requirements and design criteria.

D. Confirm impact attenuation complies with ASTM F1936.

E. Nonconforming Work: Will be replaced at the expense of installer. .

F. Replace damaged products before Date of Substantial Completion.

3.08 CLEANING

A. Clean surrounding areas of excess construction materials, debris, and waste.

B. Comply with authorities having jurisdiction for removal of excess and waste material and dispose off-site.

3.09 CLOSEOUT ACTIVITIES

3.10 MAINTENANCE

A. Provide separate maintenance contract for service and maintenance of turf and infill for 10 years from Date of Substantial Completion.

END OF SECTION 09 62 53

SECTION 09 64 66
WOOD FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide labor, materials, and equipment necessary for complete wood flooring work, including finish

B. Gymnasium Flooring

1.02 RELATED SECTIONS

A. Section 01 30 00 - Administrative Requirements

B. Section 03 30 00 - Cast in Place Concrete: Concrete floor substrate.

C. Section 05 50 00 - Metal Fabrications

1.03 REFERENCES

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2005.

B. MFMA (SPEC) - Guide Specifications for Maple Flooring Systems; Maple Flooring Manufacturers Association; current edition.

C. NOFMA (IN) - Installing Hardwood Flooring; National Oak Flooring Manufacturers Association; current edition located at www.nofma.org.

1.04 DESIGN REQUIREMENTS

A. Floor surface shall be provided to conform with the Americans with Disabilities Act (ADA)

B. Flooring system shall have been independently tested and evaluated for engineering performance according to he international standard DIN.

1.05 SUBMITTALS

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

B. See Section 01 3516 LEED Submittal Forms, for LEED submittal procedures
   1. Regionally-Sourced Products:
      a. LEED Submittals: Indicate location of manufacture; in all cases indicate location of final assembly; for harvested products, indicate location of harvest; for extracted (i.e. mined) products, indicate location of extraction; for products involving multiple manufacturing steps, indicate all locations of manufacture or assembly; provide manufacturer or supplier certification of location information.
   2. Products with Recycled Content:
      a. LEED Submittals: State unit cost, post-consumer and post-industrial content percentages, quantity installed, total material cost, and total recycled content value; attach evidence of contents from either manufacturer or an independent agency.

C. See Section 01 6116 VOC Content Restrictions, for VOC submittal procedures

D. Product Data including manufacturer's detailed technical product data installation instructions, dimension of each component, profiles, edge details, finishing and protection.

E. Shop drawings showing layout and types of wood flooring, including plans, elevations, sections, details of anchorage and attachments to other work.
   1. Indicate location, size, design, and color of game markings.

F. Submit certification that the installer has verified and will install playing line layouts in accordance with the current requirements of the applicable athletic regulations.

G. LEED Submittals:
   1. Statement from manufacturer stating recycled content percentage (by weight), whether the recycled content is post-consumer or post-industrial and location of manufacture.
   2. Certification and chain-of-custody documentation showing that wood-based materials came from Forest Stewardship Council-certified sources.
   3. Documentation from the manufacturer identifying VOC and chemical component limits for all wood glues and sealants.
   4. Documentation from the manufacturer showing that all composite wood products provided do not contain urea-formaldehyde resin.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with MFMA (SPEC).
   1. Maintain one copy of each document on site.

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 the work of this section and approved by manufacturer.

1.07 PRE-INSTALLATION MEETING

A. Convene two (2) weeks before starting work of this section.

1.08 ENVIRONMENTAL REQUIREMENTS

A. The wood flooring shall not be installed until masonry, painting, plaster tile, marble, terrazzo and other wet operations are complete.

B. The building shall be enclosed and weather tight. The building must be dry, all openings must be closed in and the permanent heating and ventilating system installed and working.

C. Permanent heating, light and ventilation shall operating during and after installation, maintaining a temperature expected during building completion.

D. The concrete subfloor shall be determined dry by the installer.

1.09 WARRANTY

A. See Section 01 7000 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two (2) year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 REFER TO "FINISH MATERIAL SCHEDULE" ON SHEET A9.0 FOR MANUFACTURER INFORMATION AND MATERIAL SELECTIONS. ALSO REFERENCE OTHER A9 SERIES DRAWINGS (FINISH PLANS) FOR ADDITIONAL INFORMATION, LOCATIONS AND EXTENT OF MATERIALS.

2.02 MANUFACTURERS

A. Manufacturers:
   1. Robbins Sport Surfaces, Cincinnati, Ohio.
   2. Action Floor Systems LLC
   3. Horner Flooring Co., Dollare Bay Michigan
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 GENERAL

A. Wood Base Components
   1. Wood fabricated from old growth timber is not permitted.
   2. Provide sustainably harvested wood, certified or labeled as specified in Section 01 60 00.

3. Core: FSC certified particleboard core conforming to ANSI 208.A LD-2 consisting of recycled fiber with no added urea-formaldehyde bonding resins.
4. Material should be extracted, harvested, or recovered as well as manufactured within a radius of 500 miles from the project site.
5. Wood fabricated from timber recovered from riverbeds or otherwise abandoned is permitted, unless otherwise noted, provided it is clean and free of contamination; identify source; provide lumber re-graded by an inspection service accredited by the American Lumber Standard Committee, Inc.
6. Particleboard, medium density fiberboard, plywood, wheatboard, strawboard, and panel substrates shall contain no added urea-formaldehyde resins

2.04 GYMNASIUM FLOORING

A. Vapor Barrier: 6 mil thick polyethylene sheet complying with Commercial Standard PS17

B. Subfloor System
   1. Resilient Pads
      a. Robbins: 7/16 inch Bio-Pads
   2. 2 Layers of 15/32 APA Rated Plywood Sheathing Exposure I, fir or southern pine, profiled load distribution subfloor
   3. Fasteners:
      a. Flooring: 2 inch barbed cleats or equivalent.
      b. Subfloor:
         1) 1 inch or 1 1/2 inch length, 7/16 inch crown, coated staples or equivalent
         2) Construction adhesive, PL400 or equivalent
   4. Provide solid blocking in lieu of resilient pads under the 'stacked' position of the Telescoping Bleachers

C. Wood Flooring:
   1. 25/32 inch thick by 2 1/4 inch wide kiln-dried, random length, continuous tongue and groove, end matched, steel knife face polished, channeled (kerfed) back, mixed grain, Northern Hard Maple MFMA -RL grade, and trademarked.
      a. Provide Second and Better
         1) Main Gymnasium

D. Base: 4 inches high and 3 inches wide, with semi-circular venting grooves on back of vertical leg. Provide premolded outside corner pieces. Color selected by Architect.
   1. Manufacturer: Vent-Cove Base by Johnsonite, Chagrin Falls, Ohio
      a. Acceptable Manufacturers:
         1) Robbins Sports Surfaces
         2) Horner Sports Floor Systems
         3) Conner Sports Flooring Corporation
         4) Substitutions: See Section 01 6000 - Product Requirements.

E. Finish: High build gym floor finish and game markings, approved by Maple Flooring Manufacturers Association
   1. Type: MFMA Group 3, Gymnasium Type (Surface) Finishes; urethane-oil or Group 5, Water Based Finishes; Polyurethane
   2. Floor Sealer Formulation: Pliable, penetrating type
   3. Finish-Coat Formulation: Formulated for gloss finish and multi-coat application
   4. Pigmented (Stain) urethane compatible with finish coats and recommended in writing by manufactures of finish coats and paint for this use.
   5. Game-line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats and paint for this use.

6. Third Coat: Finish-Coat Formulation: Formulated for gloss finish and multi-coat application
7. Fourth Coat: Finish-Coat Formulation: Formulated for gloss finish and multi-coat application
8. Manufacturer: Hillyard Floor Treatments Company, St Joseph, Missouri
    a. Acceptable Manufacturers:
        1) Robbins Sports Surfaces
        2) Action Floor Systems LLC
        3) Horner Sports Floor Systems
        4) Conner Sports Flooring Corporation
        5) Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

A. Concrete Slabs: Verify that slabs are dry according to test methods recommended by flooring manufacturer or, if none, by test methods in NOFMA's "Installing Hardwood Flooring"

B. Concrete subfloor shall be instrument checked by Flooring Contractor and discrepancies reported to the General Contractor for correction. Do not proceed until corrections are made and found acceptable.

3.02 INSTALLATION

A. General:
    1. Install in accordance with manufacturer's instructions.
    2. Starting the installation of the wood floor system will be construed as the Flooring Contractor's acceptance of conditions in the area of work.

B. Gymnasium Flooring:
    1. Vapor Barrier:
        a. Install vapor barrier over slab, lap and seal seams to provide a continuous membrane. Take care not to puncture or damage vapor barrier membrane. Lap joints minimum 6 inches.
    2. Subfloor System
        a. Install resilient pads on underside of lower plywood subfloor. 32 resilient pads per 4 x 8 sheet
        b. Provide solid blocking in lieu of resilient pads under the 'stacked' position of the Telescoping Bleachers
        c. Install the lower plywood subfloor perpendicular to the intended finish flooring direction. All joints shall be staggered and space minimum 12 inches
        d. Install the upper plywood subfloor diagonal to the lower subfloor panels staggering joints and spacing minimum 12 inches part. Secure the panels using adhesive and 1 inch staples 6 inch on center at panel perimeter and 12 inches on center throughout interior.
    3. Flooring
        a. Install finished flooring parallel with main playing court. Nail finished flooring to subfloor using power nailer.. Size joints between flooring strips, in accordance with regional humidity conditions.
        b. Size joints (expansion spaces) between flooring strips, in accordance with regional humidity conditions.
        c. Provide 2 inch expansion voids at perimeter and all vertical obstructions.

C. Sanding:
   1. Machine sand with coarse , medium, and fine paper to a smooth even uniform surface
   2. After final sanding with drum sander, buff entire floor using 100 grit screenback or equal sandpaper with a heavy duty buffing machine.
   3. Vacuum floor before first coat of finish.
   4. Floor shall present a smooth surface without drum stop marks, gauges, streaks or shiners

D. Finishing
   1. Gymnasium Flooring
      a. Apply one coat of sealer per manufacturer's application instructions.
      b. Apply a uniform coat of floor finish. Let dry at least 12 hours, then buff and clean
      c. Apply game lines and graphics
         1) Mark game lines and graphics with game line paint/stain and let dry at least 12 hours. Prepare surface to receive finish coats.
         2) Game lines shall be laid out in accordance with the drawings and current rules of Athletic Association having jurisdiction.
         3) Graphics shall be laid out in accordance with the drawings.
         4) Lines shall be straight with sharp edges of color selected by architect.
         5) Game lines to have priority over graphics
      d. Apply a uniform coat of floor finish. Let dry at least 12 hours, then buff and clean
      e. Apply second coat of floor finish and let cure for at least 7 days before permitting floor usage.

E. Base Installation:
   1. Install vented base to walls with appropriate cement. Use premolded outside corners and neatly miter inside corners.

3.03 CLEANING

A. Clean floor surfaces in accordance with manufacturer's and MFMA instructions.

3.04 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Place protective coverings over finished floors; do not remove coverings until Substantial Completion.

END OF SECTION 09 64 66

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Installation accessories.

C. Adhesives

D. Preparation for use (clean and polishing)

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

C. ASTM E 662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 1995.

D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting at least two (2) weeks prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 50 square feet of each type and color.
   3. Obtain Owner's signature acknowledging receipt of extra stock.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum five years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum five years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

1.08 FIELD CONDITIONS

A. 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.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's standard warranty to repair or replace installation that fails in material and workmanship.
   1. Warranty Period: 10 years from the date of Substantial Completion

PART 2 PRODUCTS

2.01 REFER TO "FINISH MATERIAL SCHEDULE" ON SHEET A9.0 AND SHEET A9.1 FOR MANUFACTURER INFORMATION AND MATERIAL SELECTIONS. ALSO REFERENCE OTHER A9 SERIES DRAWINGS (FINISH PLANS) FOR ADDITIONAL INFORMATION, LOCATIONS AND EXTENT OF MATERIALS.

2.02 TILE FLOORING

A. Rubber Tile: Homeogeneous wear layer bonded to backing, with color and pattern throughout wear layer thickness.(Athletic Complex, RF1)
   1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or ASTM E 648.
   2. VOC Content Limits: As specified in Section 01 61 16.
   3. Size: 24 by 24 inch nominal.
   4. Top Layer Thickness: 0.090 inch.
   5. Top Layer: two-ply vulcanized construction with a rubber wear layer
   6. Backing: Elastic Cushioned
   7. Overall Thickness: 1/4 inch.
   8. Texture: Hammered.
   9. Color: As indicated on drawings.
   10. Manufacturers:
      a. Mondo Flooring Systems
      b. BurkeMercer Flooring Products, Inc.
      c. Endura; Product ____.
      d. Johnsonite, a Tarkett Company;[____]: www.johnsonite.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

B. Rubber Tile: Homogenous, wear layer bonded to backing, with color and pattern though wear layer thickness. (Locker Room, RF1)
   1. VOC Content Limits: As specified in Section 01 61 16.
   2. Size: 24" by 24" inch.
   3. Top Layer Thickness: 0.090"
   4. Top Layer: Two-ply vulcanized construction with a rubber wear layer
   5. Backing: Elastic Cushioned

6. Overall Thickness: 3/8 inch minimum.
7. Color: As indicated on drawings.
8. ile located near shower locations, Tarkett 996 Two-part Epoxy adhesive to be applied.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
   1. Adhesives: Type to allow installation of flooring with a concrete floor slab of up to an RH of 85% as tested by ASTM F 2170 or provide penetrating moisture barrier and compatible adhesive as recommended by the flooring manufacturer.

C. Moldings, Transition and Edge Strips: Refer to "Finish Material Schedule" on drawing A9.0. Refer to A9 series drawings for more information and further detail drawings for flooring transitions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive resilient flooring.

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. Verify subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Verify that concrete sub-floor surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

C. Clean substrate by sweeping, washing or other methods to remove any loose material which may show through installed tile.

D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Fit joints and butt seams tightly.
   2. Set flooring in place, press with heavy roller to attain full adhesion.

D. Spread only enough adhesive to permit installation of materials before initial set.

E. Fit joints and butt seams tightly.

F. Set flooring in place, press with heavy roller to attain full adhesion.

G. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

H. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Resilient Strips: Attach to substrate using adhesive.

I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

J. Install flooring in recessed floor access covers, maintaining floor pattern.

K. Trowel marks and other imperfections showing through installed tile shall be reason to, remove tile, sand out trowel marks, remove or correct imperfections and reinstall tile.

3.04 INSTALLATION - TILE FLOORING

A. Install in accordance with manufacturer's instructions.

B. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Set flooring in place, press with heavy roller to attain full adhesion.

E. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

F. Install square tile to ashlar pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

I. Install flooring in recessed floor access covers. Maintain floor pattern.

J. At movable partitions, install flooring under partitions without interrupting floor pattern.

3.05 CLEANING AND POLISHING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

C. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions (preparation for commercial traffic).
   1. Scrub the floor with a neutral detergent and scrubbing pad
   2. Thoroughly rinse floor and allow it to dry.

3.06 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. Contractor is to protect flooring from time of installation to final completion of project.

C. If flooring protection is damaged, contractor shall replace it to ensure full protection.

END OF SECTION 09 65 00

SECTION 09 65 13
RESILIENT BASE & ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDE

A. Resilient Wall Base

B. Resilient Stair Treads

C. Adhesives

1.02 RELATED REQUIREMENTS

A. Section 03 35 11 - Conrete Floor Finishes

B. Section 05 51 00 - Metal Stairs

C. Section 09 65 00 - Resilient Flooring

D. Section 09 68 13 - Tile Carpeting

1.03 REFERENCED DOCUMENTS

A. ASTM F 1861 Standard Specification for Resilient Wall base

B. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

C. ASTM F 386 Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces

D. ASTM E 648 Standard Test Method for Critical Radiant Flux of Flooring systems Using a Radiant Energy Source.

E. ASTM E 662 Test Method for Specific Density of Smoke Generated by Solid Materials.

F. ASTM F 925 Standard Test Method for Resistance to Chemicals of Resilient Flooring.

G. ASTM F 137 Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus

H. ASTM F 1515 Standard Test Method for Measuring Light Stability of Resilient Vinyl Flooring by Color Change

I. National Fire Protection Association (NFPA): NFPA 255, Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source

J. National Fire Protection Association (NFPA) 258 Test Method for Specific Density of Smoke Generated by Solid Materials.

K. California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).

L. The Collaborative for High Performance Schools (CHPS)

1.04 SUBMITTALS

A. Product Data: Submit product data, including manufacturer's specification summary sheet for specified products

B. Shop Drawings: Submit shop drawings showing layout, finish colors, patterns and textures.

C. Samples: Submit selection and verification samples for finishes, colors, and textures.

D. Quality Assurance Submittals: Submit the following:
   1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
   2. Manufacturer's Instructions: Manufacturer's installation and maintenance instructions.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installing work similar to that required for this project.

B. Regulatory Requirements
   1. Fire Performance characteristics: Provide resilient sheet vinyl floor covering with the following fire performance characteristics as determined by testing products in accordance with ASTM method (and) NFPA method) indicated below by a certified testing laboratory or another testing and inspecting agency acceptable to authorities having jurisdiction.
      a. ASTM E 648 (NFPA 253), Critical Radiant Flux of Floor Covering Systems: Class 1, > 1.0 W/cm2
      b. ASTM E 662 (NFPA 258), Specific Optical Density of Smoke Generated by Solid Materials: Passes, <450
      c. ASTM E 84 (NFPA 255), Surface Building Characteristics of Building Materials: Class C

C. Single-Source Responsibility: Obtain resilient wall base and manufacturer's recommended adhesive from a single supplier.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Storage and Protection: Store materials protected from exposure to harmful weather conditions and acclimated to site conditions at temperature and humidity conditions recommended by manufacturer.

C. 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.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's standard warranty to repair or replace installation that fails in material and workmanship.
   1. Warranty Period: 3 years form the date of Substantial Completion

PART 2 PRODUCTS

2.01 REFER TO "FINISH MATERIAL SCHEDULE" ON SHEET A9.0 FOR MANUFACTURER INFORMATION AND MATERIAL SELECTIONS. ALSO REFERENCE OTHER A9 SERIES DRAWINGS (FINISH PLANS) FOR ADDITIONAL INFORMATION, LOCATIONS AND EXTENT OF MATERIALS.

2.02 MANUFACTURER:

A. Acceptable Manufacturers:
   1. Johnsonite, a Tarkett Company: www.johnsonite.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 RESILIENT WALL BASE

A. Minimum Requirements:
   1. Thickness tolerance: Complies with ASTM F-386

2. Flexibility: Complies with ASTM F-137
3. Resistance to Heat Aging: Complies with ASTM F-1515
4. Resistance to Detergents: Complies with ASTM F-925
5. Resistance to Alkalis: No fading or softening
6. Dimensional Stability: Complies with ASTM F 1861
7. Squareness: 90 degrees +/- 0.5 degrees

B. Product:
1. Refer to A9, Material Finish Schedule for product information and details.(RB1 & RB2)
2. Roppe Pinnacle Rubber Base
   a. a. Complies with ASTM F-1861 Type TS (Thermoset Vulcanized Rubber), Group 1 (Solid)
   b. Contains 10% natural rubber
   c. Thickness: 1/8" (3.175 mm) nominal
   d. Color as selected by Architect from manufacturer's standard colors.
   e. Profile:
      1) Standard toe (cove) for resilient installations
   f. Nominal Height: 4" and 6"
   g. Lengths: rolls (coil)
   h. Corners
      1) Formed by installer on site

2.04 RESILIENT STAIR TREADS

A. Refer to A9, Material Finish Schedule for product information and details.(RST)

B. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness.
1. Manufacturers:
   a. Burke Flooring; www.burkeflooring.com.
   b. Johnsonite, a Tarkett Company; www.johnsonite.com.
   c. Roppe Corp; www.roppe.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
3. Minimum Requirements: Comply with ASTM F1700, of Class III, Type B.
4. VOC Content: As specified in Section 01 61 16.
5. Nominal Thickness: 0.1875 inch.
6. Nosing: Square.
   a. Striping: 2 inch wide contrasting color abrasive strips.
7. Texture: Smooth.
8. Color: As indicated on drawings.
9. Pattern: Discs.

2.05 ACCESSORIES

A. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions are acceptable for installing product in accordance with manufacturer's instructions.

B. Material Inspection: In accordance with manufacturer's installing requirements, visually inspect materials prior to installing. Material with visual defects shall not be installed.

3.02 PREPARATION

A. Prepare substrate in accordance with manufacturer's instructions.

B. Prepare manufacturer's recommended substrates to be smooth, rigid, flat, level, permanently dry, clean and free of foreign materials such as paint, dust, grease, oils, solvent, old adhesive residue, vinyl wall coverings, non-porous surfaces and all other contaminants that may interfere with adhesive bond.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of conditions.

B. Install in accordance with manufacturer's instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

E. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold.

F. Install base on solid backing. Bond tightly to wall and floor surfaces.

G. Install base on casework base. Bond tightly to casework and floor.

H. Scribe and fit to door frames and other interruptions.

I. Trowel marks and other imperfections showing through installed base shall be reason to, remove base, sand out trowel marks, remove or correct imperfections and reinstall base.

3.04 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Repair or replace damaged installed products.

C. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

D. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 09 65 13

SECTION 09 65 66
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rubber sheet flooring, adhesively installed.

B. Painted game lines.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

B. Section 09 65 13 - Resilient Base & Accessories

1.03 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.

F. ASTM F2772 - Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems; 2011 (Reapproved 2019).

G. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.

H. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification; 2006.

I. SCS (CPD) - SCS Certified Products; current listings at www.scscertified.com.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Verification Samples: Actual flooring material specified, not less than 12 inch square, mounted on solid backing.
   1. Include samples of game lines, illustrating colors selected.

E. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer certified in writing by the flooring manufacturer to be qualified for installation of specified flooring system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

PART 2 PRODUCTS

2.01 REFER TO "FINISH MATERIAL SCHEDULE" ON SHEET A9.0 FOR MANUFACTURER INFORMATION AND MATERIAL SELECTIONS. ALSO REFERENCE OTHER A9 SERIES DRAWINGS (FINISH PLANS) FOR ADDITIONAL INFORMATION, LOCATIONS AND EXTENT OF MATERIALS.

2.02 PREFORMED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.
   1. Ecore Sports Flooring: https://www.ecoreathletic.com/
   2. Mondo: https://www.mondoworldwide.com/na.en/
   3. Dynamic Sports Construction
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Rolled Rubber Sheet Flooring: Two-layer vulcanized rubber, RR1, RR2 and RR3.
   1. Thickness: Minimum.10.5 mm.
   2. Base Layer: 8mm shock absorbing base layer, Recycled SBR (styrene butadiene rubber).
   3. Sheet Width: Minimum 48 inches.
   4. Surface Texture: Smooth.
   5. Color: As indicated on drawings.

C. Rubber Athletic Flooring (RA1):
   1. Wearing Surface: Co-vulcanized multilayer rubber surface material with uniform color throughout thickness, non-porous surface.
   2. Sheet Thickness: Minimum 10 mm .
   3. Sheet Width: Minimum 48 inches.
   4. Sheet Length: Maximum 65". Installed as necessary to minimize traverse seams.
   5. Tensile Strength: Minimum >210 psi, per ASTM D412.
   6. Seaming Method: Welding with heat.
   7. Surface Texture: Rock-granulate-textured.
   8. Color: As indicated on drawings.
   9. Game Lines: Paint as approved by manufacturer of Rubber Atheltic Flooring

D. Rubber Athletic Flooring (RA2)
   1. Thickness: Minimum 10 mm.
   2. Sheet Width: Nominal 48 inch
   3. Tensile Strength: Minimum >210 psi, per ASTM D412.
   4. Surface Texture: Embossed.
   5. Color: As selected from manufacturer's standard range.
   6. Products:
      a. Dinoflex Group; Next Step High Impact: www.dinoflex.com/#sle.

b. Ecore Sports Flooring: https://www.ecoreathletic.com/
c. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

C. Transition Strips: As indicated on drawings

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. 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 athletic flooring to substrate.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius.

B. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

C. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Resilient Sheet Flooring:
1. Unroll flooring and allow to relax before beginning installation.
2. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
3. Weld seams using techniques and equipment recommended by manufacturer.
4. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION 09 65 66

SECTION 09 67 23
URETHANE RESINOUS FLOORING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Resinous flooring system as shown on the drawings and in schedules. Note this as an alternate.

1.03 RELATED SECTIONS INCLUDE THE FOLLOWING:

A. Section 03 30 00 - Cast-in-Place Concrete

1.04 SYSTEM DESCRIPTION

A. The work shall consist of preparation of the substrate, the furnishing and application of a cementitious urethane based self-leveling seamless flooring system with flintshot quartz aggregate broadcast and urethane topcoat.

B. The system shall have the color and texture as specified by the Owner with a nominal thickness of 3/16 inch. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

C. Cove base (if required) to be applied where noted on plans and per manufacturers standard details unless otherwise noted

1.05 SUBMITTALS

A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.

B. Manufacturer's Material Safety Data Sheet (MSDS) for each product being used.

C. Samples: A 6 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system.

1.06 QUALITY ASSURANCE

A. The Manufacturer shall have a minimum of 5 years experience in the production, sales, and technical support of cementitious urethane, polyurethane industrial flooring and related materials.
   1. The Applicator shall have been approved by the flooring system manufacturer in all phases of minimum 10 installations with material in a kitchen application setting.
   2. Surface preparation and application of the product specified. In addition, the applicator should have performed at
      a. No requests for substitutions shall be considered that would change the generic type of the specified system

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping
   1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.

1.08 STORAGE AND PROTECTION

A. The Applicator shall be provided with a dry storage area for all components. The area shall be between 60 F and 85 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.

B. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

C. Waste Disposal
   1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.09 PROJECT CONDITIONS

A. Site Requirements
   1. Application may proceed while air, material and substrate temperatures are between 55 F and 85 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
   2. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
   3. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

B. Conditions of new concrete to be coated with cementitious urethane material.
   1. Concrete shall be moisture cured for a minimum of 7 days and have fully cured a minimum of 14 days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
   2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary or desirable).
   3. Sealers and curing agents should not to be used.
   4. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

C. Safety Requirements
   1. The Owner shall be responsible for the removal of foodstuffs from the work area.
   2. Non-related personnel in the work area shall be kept to a minimum.

1.10 WARRANTY

A. Manufacturer warrants that material shipped to buyers at the time of shipment substantially free from material defects and will perform substantially to manufacturers published literature if used in accordance with the latest prescribed procedures and prior to the expiration date.

B. Manufacturers liability with respect to this warranty is strictly limited to the value of the material purchase.

PART 2 – PRODUCTS

2.01 REFER TO "FINISH MATERIAL SCHEDULE" ON SHEET A9.0 FOR MANUFACTURER INFORMATION AND MATERIAL SELECTIONS. ALSO REFERENCE OTHER A9 SERIES DRAWINGS (FINISH PLANS) FOR ADDITIONAL INFORMATION, LOCATIONS AND EXTENT OF MATERIALS.

2.02 FLOORING

A. Basis of Design: Torginol, www.torginol.com

B. Other Approved Manufacturers
   1. Dur-A-Flex, Inc, Poly-Crete, SLB, Urethane topcoat seamless flooring system.
   2. Key Resin, Urecon SLT Quartz, www.keyresin.com

3. Manufacturer of Approved System shall be single source and made in the USA.

2.03 PRODUCT REQUIREMENTS

A. DUR-A-FLEX, DUR-A-CHIP

1. Primer, Dur-A-Glaze WB
   a. VOC 2 g/L
   b. Elongations, ASTM D-2370 9%
   c. Impact Resistance, MF D-2794 >160
   d. Hardness, ASTM D-3363 3H
   e. Abrasion Resistance , ASTM D-4060
      1) CS17 Wheel (100g load) 1000 cycles 30 mg loss
   f. Adhesion, ASTM D-4541 550 psi (concrete failure)
   g. Coefficient of Friction, ASTM D-2047 >0.6
   h. 60 Gloss, ASTM D-523 85+
2. Broadcast Coat Dur-A-Glaze #4 Resin
   a. Percent Reactive, 100 %
   b. VOC <4 g/L
   c. Water Absorption, ASTM D 570 0.04%
   d. Tensile Strength, ASTM D 638 4000psi
   e. Coefficient of thermal expansion
      1) ASTM D 696, 2 x 10-5 in/in/F
   f. Flammability ASTM D-635 Self-Extinguishing
   g. Flame Spread/ NFPA 101 ASTM E-84 Class A
3. Decorative Flakes
   a. Reference FINISH MATERIAL SCHEDULE on sheet A9.0 for basis of design and color intent.
      1) RES1: Hybrid size flake blend, TORGINOL Terrazzo & Stone Flake
4. Topcoat Armor Top
   a. VOC 0 g/L
   b. 60 Degree Gloss ASTM D523 75+/-5
   c. Mixed Viscosity, (Brookfield 25oC) 500 cps
   d. Tensile strength, ASTM D 638 7,000 psi
   e. Abrasion Resistance, ASTM D4060 Satin
      1) CS 17 wheel (1,000 g load) 1,000 cycles
      2) 4 - 8 mg loss with grit
      3) 10 - 12 mg loss without grit
   f. Pot life @ 70o F 50% RH 2 hours
   g. Dry properties, 70oF, 50% R.H. 8 hours tack free, 12 hours Dry
      1) 60oF, 30% RH 12 hours tack free, 18 hours Dry
         (a) 80oF, 70%RH 4 hours tack free, 6 hours Dry
   h. Flash Point PMCC 186oF
   i. Full Chemical resistance 7 days

B.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.

1. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.02 PREPARATION

A. General
   1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
   2. Moisture Testing: Perform anhydrous calcium chloride test ASTM F 1869-98.
      a. Perform three tests for the first 1,000 sf and then one test per 1,000 sf after that.
         1) Application will proceed only when the vapor/moisture emission rates from the slab is less than and not higher than 12 lbs/1,000 sf/24 hrs.
         2) If the vapor drive exceeds 12 lbs/1,000 sf/24 hrs then the Owner and/or Engineer shall be notified and advised of additional cost for the possible installation of a vapor mitigation system that has been approved by the manufacturer or other means to lower the value to the acceptable limit.
         3) Mechanical surface preparation
            (a) Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.
            (b) Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
            (c) Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
            (d) Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
         4) At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.03 APPLICATION

A. General
   1. The system shall be applied in three distinct steps as listed below:
      a. Substrate preparation
      b. Topping/overlay application with quartz aggregate broadcast.
      c. Topcoat application
   2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
   3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
   4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
   5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

6. Joint Filler: Key #780-M Epoxy Membrane - two-part, 100% solids flexible epoxy with aliphatic amines
    a. In instances of severe cracking use sheet membrane prior to flooring installation

B. Topping
1. The topping shall be applied as a self-leveling system as specified by the Architect. The topping shall be applied in one lift with a nominal thickness of 1/8 inch.
2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. SL Aggregate shall then be added to the catalyzed mixture and mixed in a manner to achieve a homogenous blend.
4. The topping shall be applied over horizontal surfaces using a flat squeegee, trowels or other systems approved by the Manufacturer.
5. Immediately upon placing, the topping shall be degassed with a loop roller.
6. Quartz aggregate shall be broadcast to excess into the wet material at the rate of 1 lbs/sf.
7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

C. Topcoat
1. The topcoat shall be mixed and applied per manufacturer recommended procedure.
2. The topcoat shall be comprised of three components, a resin, hardener and filler as supplied by the manufacturer.
3. The topcoat will be applied at the rate of 100 sf per kit.
4. Non-Skid if required is broadcast at the rate of 1 lb per 100 sf and back rolled into the coating.
5. The finish floor will have a nominal thickness of 3/16 inch.

D. Field-Formed Integral Cove Base:
1. Apply cove base mix to wall surfaces before applying flooring coats.
2. Apply in accordance with manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base.
3. Round internal and external corners.
4. Integral Cove Base: 6" integrated with epoxy wall coating system.
5. Aluminum cove cap trim strip at top of base

3.04 FIELD QUALITY CONTROL

A. Tests, Inspection
1. The following tests shall be conducted by the Applicator:
    a. Temperature
        1) Air, substrate temperatures and, if applicable, dew point.
2. Coverage Rates
    a. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.05 CLEANING AND PROTECTION

A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION 09 67 23

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Walk-off tile carpet.

B. Accessories

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

B. Section 09 65 13 - Resilient Base and Accessories.

C. Division 26 Electrical: Electrical floor cover plate with recess for carpet.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints, direction of carpet pile, and location of edge moldings.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: 30 tiles of each color and pattern installed.
   3. Obtain Owner's signature acknowledging receipt of extra stock.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Carpet shall meet or exceed Carpet and Rug Institutes (CRI) Appearance Retention Rating of 3.5 ARR.

C. Products comply with requirements of CRI's Green Label Indoor Air Quality Testing Program.

D. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Concrete subfloors must meet the following requirements before carpet may be installed:
   1. Comply with manufacturers moisture requirements
   2. pH range of 5 to 9

3. Moisture-emission rate of 3 lb/1000 sq ft per 24 hours or less.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Backing: Provide 10 year or greater manufacturer's warranty against fiber abrasive wear, fiber static protection, backing (tuftbind/zippering, integrity/dimensional stability), and edge ravel.

PART 2 PRODUCTS

2.01 REFER TO "FINISH MATERIAL SCHEDULE" ON SHEET A9.0 FOR MANUFACTURER INFORMATION AND MATERIAL SELECTIONS. ALSO REFERENCE OTHER A9 SERIES DRAWINGS (FINISH PLANS) FOR ADDITIONAL INFORMATION, LOCATIONS AND EXTENT OF MATERIALS.

2.02 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Refer to "Finish Material Schedule" on drawing A9.0.

C. Adhesives:
   1. Recommended by carpet manufacturer.
   2. Type to allow installation of flooring with a concrete floor slab of up to an RH of 85% as tested by ASTM F2170 or provide penetrating moisture barrier and compatible adhesive as recommended by the flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Verify that concrete sub-floor and self leveling underlayment surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by carpet tile manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Perform test recommended by manufacturer, following adhesive manufacturer's application instructions for use on non-porous substrates.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in pattern as directed by the Architect

F. Lay carpet tile parallel to building lines.

G. Locate change of color or pattern between rooms under door centerline.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION 09 68 13

SECTION 09 84 13
CEMENTITIOUS WOOD FIBER PANELS

PART1 GENERAL

1.01 SECTION INCLUDES

A. Cementitious wood fiber plank acoustical wall panel system and installation accessories. Note this an an alternate

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry

B. Section 09 21 16 - Gypsum Board Assemblies

C. Section 09 90 00 - Painting and Coating.

1.03 REFERENCE STANDARD

A. ASTM C635 Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

B. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

C. ASTM E1264 Standard Classification for Acoustical Ceiling Products.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data and installation instructions.

C. Samples: Submit selection and verification samples: 6 inch × 6 inch (152 × 152 mm) sample for each wall panel unit required, showing full range of exposed texture to be expected in completed work.

D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available .

E. Recommended procedures for normal cleaning and removal of stains including precautions in use of cleaning materials that may be detrimental to surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity.

B. Manufacturer Qualifications: Company with not less than 5 years of experience in manufacturing acoustical products similar to those specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical panels from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until panels are needed for installation.

B. Store panels flat, in dry, well-ventilated space; do not stand panels on end.

C. Protect panel edges from damage.

1.07 PROJECT/SITE CONDITIONS

A. Coordinate acoustical wall treatment installation with size, location and installation of service utilities.

B. Do not install acoustical panels until building is closed in and HVAC system is operational.

C. Locate materials on-site at least 24 hours before beginning installation to allow materials to reach temperature and moisture content equilibrium.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturer: .
   1. Tectum Inc: www.tectum.com.

2.02 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Provide acoustical wall panel assembly designed and tested to provide surface burning characteristics (ASTM E84) as follows:
      a. Flamespread: 0.
      b. Smoke Developed: 0.
   2. Provide acoustical wall panel system which has been manufactured, fabricated and installed to provide Noise Reduction Coefficient (NRC) rating of 1.00.

2.03 ACOUSTICAL WALL PANEL SYSTEM

A. Standard Interior Wall Panels:
   1. Material: Aspen wood fibers bonded with inorganic hydraulic cement.
   2. Thickness: 1 inch (25.4 mm).
   3. Edge: Long edge beveled
   4. Width: As shown on the drawings.
   5. Length: As shown on the drawings.
   6. Color: Color as selected by the Architect from manufacturer's standard line.
   7. Mounting Style:A. .
   8. Provide all fasteners, Furring strips and fiberglass insulation for a complete single source installation

2.04 ACCESSORIES

A. Tectum Painted Head Drywall Screws:
   1. Material: Steel.

B. Tectum Moulding:
   1. Material: Plastic.

C. Tectum Touch-Up Paint:

D. Acoustic Insulation: ASTM C665; friction fit type, unfaced.
   1. Products:
      a. Walls: Fiberglass Sound Attenuation Batts, Batts shall be full depth of furring strips and width to match furring strip spacing.
   2. Manufacturers:
      a. CertainTeed/ Stain-Gobain; nosier Reducer Sound Attenuation Batts: www.certainteed.com
      b. Johns Manville:
      c. Owens Corning Fiberglass Corporation; Sound Attenuation Batt Insulation (SAB) fiber glass insulation
      d. Substitutions: See Section 01600 - Product requirements.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Comply with the instructions and recommendations of the acoustical wall panel system manufacturer.

3.02 EXAMINATION

A. Examine surfaces scheduled to receive suspended or directly attached acoustical units for unevenness, irregularities and dampness that would affect quality and execution of work.

B. Do not proceed with installation of wall panel system until unacceptable conditions are corrected.

3.03 INSTALLATION

A. Install 1 x furring strips 2 inches on center and around perimeter of panel(s)

B. Place acoustical insulation between furring strips

C. Securely affix wall panels by means of splines attached vertically to smooth wall or furring strips. Engage vertical kerf on the edges of the wall panels with splines. Apply adhesive where necessary.

D. Screw head to be flush with panel surface.

3.04 CLEANING

A. Clean exposed surfaces of acoustical panel, trim, moldings and suspension members to comply with manufacturer's instructions for cleaning.

B. Touch up any minor finish damage.

C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.05 PROTECTION

A. Protect installed work from damage due to subsequent construction activity.

END OF SECTION 09 84 13

SECTION 09 84 30
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 09 51 00 - Acoustical Ceilings: Ceiling suspension system.

B. Section 09 91 23 - Interior Painting.

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

C. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2005 (Reapproved 2012).

1.04 SUBMITTALS

A. See Section 01 30 00 - 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. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Panels: Quantity equal to 1 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 REFER TO "FINISH MATERIAL SCHEDULE" ON SHEET A9.0 FOR MANUFACTURER INFORMATION AND MATERIAL SELECTIONS. ALSO REFERENCE OTHER A9 SERIES DRAWINGS (FINISH PLANS) FOR ADDITIONAL INFORMATION, LOCATIONS AND EXTENT OF MATERIALS.

2.02 SOUND-ABSORBING UNITS

A. Manufacturers:

1. Essi Acoustical Products Company: www.essiacoustical.com/#sle.
2. Autex; Quietspace Panel.
3. MDC Interior Solutions, Zintra: https://www.mdcwall.com/
4. Keiri: https://www.kireiusa.com/
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. General:
1. Prefinished, factory assembled thermally bonded polyester panels.
2. 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. Acoustical Panels for Walls: (AP)
1. Panel Core: 100% polyester fiber (PET)
2. Noise Reduction Coefficient (NRC): .10 to .30 when tested in accordance with ASTM C423 for mounting, per ASTM E795.
3. Panel Thickness: 1 inch or as noted on the drawings.
4. Edges: Perimeter edges reinforced by a formulated resin hardener.
5. Corners: Square.
6. Color: As indicated.
7. Mounting Method: Direct applied with adhesive.

2.03 FABRICATION

A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.04 ACCESSORIES

A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:
1. Metal impaling clips designed to support full weight of panels, mechanically attached to substrate and adhesively bonded to back of panels.

B. Trim Moldings: Manufacturer's standard Metal trim moldings for concealing panel joints; color Black.

C. Fixing Clips: Manufacturers standard for application as indicated.

D. Furring Strips: As recommended by manufacturer.

E. Panel Adhesive: Acceptable to acoustical panel manufacturer 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 as 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.

3.03 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 Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION 09 84 30

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Shop-primed items.

B. Section 09 91 23 - Interior Painting.

C. Section 09 96 00 - High-Performance Coatings.

D. Section 23 37 00 - Air Outlets and Inlets

E. Section 23 37 10 - Exterior Wall Louvers

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

D. SSPC-SP 1 - Solvent Cleaning; 2015.

E. SSPC-SP 2 - Hand Tool Cleaning; 2018.

F. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

G. SSPC-SP 13 - Surface Preparation of Concrete; 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. 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 samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
   3. Allow 30 days for approval process, after receipt of complete samples by Architect.

D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five yearsdocumented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and approved by manufacturer.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

PART 2 PRODUCTS

2.01 REFER TO "FINISH MATERIAL SCHEDULE" ON SHEET A9 FOR MANUFACTURER INFORMATION AND MATERIAL SELECTIONS. ALSO REFERENCE OTHER SERIES DRAWINGS (FINISH PLANS) FOR ADDITIONAL INFORMATION, LOCATIONS, AND EXTENT OF MATERIALS.

2.02 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. If a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.
   3. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.

B. Paints:

1. Behr Process Corporation: www.behr.com.
2. PPG Paints: www.ppgpaints.com.
3. Pratt & Lambert Paints: www.prattandlambert.com.
4. Sherwin-Williams Company: www.sherwin-williams.com/.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

2.04 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, brick, fiber cement siding, primed wood, and primed metal
1. Two top coats and one coat primer.
2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
a. Products:
1) Behr Marquee Exterior Satin Enamel [No. 9450]. (MPI #15)
2) Pittsburgh Paints Acri-Shield Max Exterior Latex, 739-10 Series, Satin.
3) Rodda Protector Satin, 532201. (MPI #15)
4) Sherwin-Williams Resilience, Satin. (MPI #15)
3. Top Coat(s): Exterior Light Industrial Coating, Water Based; MPI #161, 163, or 164.
a. Products:
1) Behr Premium Interior/Exterior Direct-To-Metal Paint Gloss [No. 8200]. (MPI #164)
2) Pittsburgh Paints Pitt-Tech Plus DTM Industrial Enamel, 90-1310 Series, Gloss.

B. Paint ME-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
2. Semi-gloss: Two coats of latex enamel.

2.05 PRIMERS

A. Primers: Provide the primer as required or recommended by manufacturer of top coats.

2.06 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:

G. Masonry:

H. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

I. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 91 13

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Elevator pit ladders.
   3. Prime surfaces to receive wall coverings.
   4. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Ceramic and other tiles.
   7. Glass.
   8. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Shop-primed items.

B. Section 05 51 00 - Metal Stairs: Shop-primed items.

C. Section 09 91 13 - Exterior Painting.

D. Division 23 - Mechanical

E. Section 23 37 00 - Air Outlets and Inlets

F. Section 23 37 10 - Exterior Wall Louvers

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

E. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

F. SSPC-SP 1 - Solvent Cleaning; 2015.

G. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
   3. Allow 30 days for approval process, after receipt of complete samples by Architect
   4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five yearsdocumented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years documented experience.

1.06 MOCK-UP

A. See Section 01 43 00 - Quality Assurance, for general requirements for mock-up.

B. Mock-up may remain as part of the work.

1.07 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.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 REFER TO "FINISH MATERIAL SCHEDULE" ON SHEET A9.0 FOR MANUFACTURER INFORMATION AND MATERIAL SELECTIONS. ALSO REFERENCE OTHER A9 SERIES DRAWINGS (FINISH PLANS) FOR ADDITIONAL INFORMATION, LOCATIONS AND EXTENT OF MATERIALS.

2.02 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.
   3. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.

B. Paints:
   1. Behr Process Corporation: www.behr.com.
   2. PPG Paints: www.ppgpaints.com.
   3. Pratt & Lambert Paints: www.prattandlambert.com.
   4. Sherwin-Williams Company: www.sherwin-williams.com.
   5. Valspar Corporation: www.valsparpaint.com.

C. Transparent Finishes:
   1. Behr Process Corporation: www.behr.com.
   2. PPG Paints Deft Interior Clears/Polyurethanes: www.ppgpaints.com.
   3. Sherwin-Williams Company: www.sherwin-williams.com.

D. Stains:
   1. Behr Process Corporation: www.behr.com.
   2. PPG Paints Deft Interior Stains: www.ppgpaints.com.
   3. Sherwin-Williams Company: www.sherwin-williams.com.

E. Primer Sealers: Same manufacturer as top coats.

F. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
   2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   5. Supply each paint material in quantity required to complete entire project's work from a single production run.
   6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
      b. SCAQMD 1113 Rule.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.
   1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.04 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete masonry units, wood, uncoated steel, shop primed steel, and galvanized steel.

B. Sheen: Eggshell / Satin
   1. Two top coats and one coat primer.
   2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
      a. Products:
         1) Behr Premium Plus Interior Flat [No.1050]. (MPI #143)
         2) Behr Premium Plus Interior Satin Enamel [No.7050]. (MPI #146)
         3) Behr Premium Plus Interior Semi-Gloss Enamel [No.3050]. (MPI #147)
         4) Pittsburgh Paints Speedhide Zero Interior Latex, 6-5110 Series, Flat. (MPI #143)
         5) Pittsburgh Paints Speedhide Zero Interior Latex, 6-5310 Series, Eggshell.
         6) Pittsburgh Paints Speedhide Zero Interior Latex, 6-5510 Series, Semi-Gloss. (MPI #147)
         7) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat.

8) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Low Sheen. (MPI #144)
9) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Semi-Gloss.

3. Top Coat Sheen:
   a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
   b. Eggshell: MPI gloss level 3; use this sheen at all locations unless otherwise noted.

C. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
1. Medium duty applications include doors, door frames, railings, handrails, and guardrails.
2. Sheen: Semi-gloss
3. Two top coats and one coat primer.
4. Top Coat(s): Interior Light Industrial Coating, Water Based; MPI #151, 153, or 154.
   a. Products:
      1) Pittsburgh Paints Pitt-Tech Plus EP WB DTM Industrial Enamel. 90-1610 Series, Semi-Gloss. (MPI #153)
      2) Rodda Multi Master DTM Acrylic Semi-Gloss Enamel, 548901. (MPI #153)
      3) Sherwin-Williams Pro Industrial Acrylic Coating, Semi-Gloss. (MPI #153)
      4) Substitutions: See Section 01 60 00 - Product Requirements
5. Top Coat Sheen:
   a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations unless otherwise noted.
6. Primer: As recommended by top coat manufacturer for specific substrate.

D. Paint I-OP-MD-WC - Medium Duty Vertical: Including gypsum board, plaster, concrete, and concrete masonry units. Use at all locations designated as Epoxy Paint (EPT) on drawings.
1. Two top coats and one coat primer.
2. Top Coat(s): Interior Light Industrial Coating, Water Based; MPI #151, 153, or 154.
   a. Products:
      1) Behr Pro, Pre-Catalyzed Waterborne Epoxy Semi-Gloss No. HP150
      2) Pittsburgh Paints Pitt-Glaze WB1 Water-Borne Acrylic Epoxy, 16-510 Series, Semi-Gloss. (MPI #153)
      3) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #153)
      4) Substitutions: See Section 01 60 00 - Product Requirements
3. Top Coat Sheen:
   a. Eggshell: MPI gloss level 3; use this sheen at all locations.
4. Primer: As recommended by top coat manufacturer for specific substrate.

E. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted serviceslocated in areas that have no ceilings, and all ceiling materials are intended to be exposed to view, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
1. Prime materials as required by finish coat manufacturer.
2. Top coat: It is the responsibility of the painting contractor to ensure that all materials are properly covered. If a second coat is required, that will be determined by the Architect upon completion of the first coat.
3. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
   a. Products:
      1) Pittsburgh Paints Speedhide Super Tech Water Based Interior Dry-Fog Latex, 6-724XI, Eggshell. (MPI #155)
      2) Sherwin-Williams Waterborne Acrylic Dryfall, Eg-Shel. (MPI #155, 226)
4. Top Coat Sheen:

a. Eggshell: MPI gloss level 3; use this sheen at all locations.

5. Primer: As recommended by top coat manufacturer for specific substrate.

F. Paint I-TR -W - Transparent Finish on Wood.

1. Stain: Semi-Transparent Stain for Wood; MPI #90.
2. Top Coat(s): Clear Lacquer; MPI #85, 86, or 87.

2.05 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

1. Interior/Exterior Latex Block Filler; MPI #4.
   a. Products:
      1) Kilz Pro-X p50 Block Filler Primer.
      2) Pittsburgh Paints Speedhide Masonry Hi Fill Latex Block Filler, 6-15XI. (MPI #4)
      3) Sherwin-Williams Loxon Block Surfacer. (MPI #4)
      4) Substitutions: See Section 01 60 00 - Product Requirements
2. Interior Drywall Primer Sealer.

2.06 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. 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 is below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Plaster and Stucco: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Masonry:

1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
2. Prepare surface as recommended by top coat manufacturer.

F. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high-alkali surfaces.

I. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

J. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

K. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

L. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Wood to Receive Transparent Finishes: See Section 09 93 00.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 91 23

SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Markerboards

B. Tackboards

C. Visual display board accessories

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

B. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

C. Section 10 22 39 - Folding Panel Partitions: Installation of visual display boards on operable partitions.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on markerboard, tackboard, tackboard surface covering, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.

D. Samples: Submit two samples 2 by 2 inch in size illustrating materials and finish, color and texture of chalkboard, markerboard, tackboard, tackboard surfacing, and trim.

E. Test Reports: Show compliance to specified surface burning characteristics requirements.

F. Manufacturer's printed installation instructions.

G. Maintenance Data: Include data on regular cleaning, stain removal and recommended maintenance precautions.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Dry Erase Kits: One per room
   3. Obtain Owner's signature acknowledging receipt of extra stock.

1.05 DELIVERY, STORAGE AND HANDLING

A. Comply with manufacturer's instructions for handling and storage of units.

1.06 FIELD CONDITIONS

A. Field measure prior to fabrication to ensure proper fit.

B. Do not begin installation of visual display boards until environmental conditions approximate normal occupied conditions.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Visual Display Boards:
   1. Manufacturer: Claridge Products and Equipment Inc.: www.clardigeproducts.com
   2. Acceptable Manufacturers:
      a. Educational Equipment / K-Pro
      b. Ghent
      c. Greensteel
      d. Marsh
      e. Patinum Visual Systems
      f. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 VISUAL DISPLAY UNITS

A. Markerboards: Porcelain enamel on steel, laminated to core.
   1. Color: White.
   2. Steel Face Sheet Thickness: 24 gage, 0.0239 inch .
   3. Core: Hardboard, 7/16 inch thick, laminated to face sheet.
   4. Backing: Aluminum foil, laminated to core.
   5. Height: 48 inches.
   6. Length: As indicated on drawings.
   7. Frame: Extruded aluminum , with concealed fasteners.
   8. Frame Finish: Anodized, Black.
      a. Claridge Products Inc., Series 1
      b. Perimeter Trim: 1 1/2 inch wide
      c. Mounting Clips: 2 feet on center top and bottom
   9. Accessories: Provide marker tray.
      a. LCS Dry Erase Kit: One (1) per room
         1) Four (4) fine point and eight broad tipped markers
         2) One (1) 8 oz bottle markerboard cleaner
         3) One (1) markerboard eraser

B. Tackboards: Fine-grained, homogeneous natural cork with designer fabric
   1. Cork Thickness: 1/4 inch.
   2. Fabric: As indicated on drawings. Refer to A9.0 Finish Material Schedule.
   3. Backing: Hardboard, 1/4 inch thick, laminated to tack surface.
   4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
   5. Height: As indicated on drawings
   6. Length: As indicated on drawings.
   7. Frame: Same type and finish as for markerboard.
   8. Frame Finish: Anodized, Black.
      a. Claridge Products Inc., Series 1
      b. Perimeter Trim: 1 1/2 inch wide
      c. Mounting Clips: 2 feet on center top and bottom

2.03 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

B. Hardboard for Cores: ANSI A135.4, Class 1 - Tempered, S2S (smooth two sides).

C. Foil Backing: Aluminum foil sheet, 0.005 inch thick.

D. Aluminum Sheet Backing: 27 gage, 0.014 inch thick.

E. Adhesives: Type used by manufacturer.

2.04 ACCESSORIES

A. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

B. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.

C. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are properly prepared to receive visual display boards. Do not begin installation until unsatisfactory conditions have been corrected.

B. Verify that field measurements are as indicated.

C. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

C. Butt Joints: Install with tight hairline joints.

D. Install tackable wall panels in accordance with manufacturer's recommendations on specified substrates with concealed attachments.

3.03 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION 10 11 00

SECTION 10 14 19
DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building Letters.

1.02 RELATED SECTIONS

A. Section 01 60 00 - Products Requirements

B. Section 07 24 00 - Exterior Insulation and Finish System

C. Section 04 20 00 - Unit Masonry.

1.03 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples:
   1. Submit one (1) sample building letter, text style, etc.
   2. Sample will be returned to contractor.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors specified not less than 10 inches by 12 inches.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to OBBC code and ANSI A117.1 for requirements for the physically handicapped.

B. Signage shall conform to with the Americans with Disabilities Act Accessibility Guidelines (ADAAG). These requirements supersede Technical Specifications in this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 6000 - Product Requirements.

B. Store adhesive attachment tape at ambient room temperatures.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs 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 REFER TO A12 SERIES DRAWINGS FOR SIGNAGE MATERIALS, LAYOUT AND LOCATIONS

2.02 BUILDING LETTERS

A. Manufacturer Basis of Design: Forty Nine Degrees, Coldwater, Ohio specified as the type, size, function and quality of the products required.
   1. Ace Sign Systems Inc., Ft Wayne Indiana
   2. Americraft Co. Inc
   3. ASI Sign Systems, Indianapolis, Indiana: Cleveland, Ohio: Cincinnati, Ohio
   4. Columbus Graphics Inc.
   5. Ellet Sign Company: www.elletneon.com
   6. Forty Nine Degrees, Coldwater, Ohio
   7. Matthews, Pittsburgh, Pennsylvania
   8. Substitutions: See Section 01 6000 - Products Requirements
      a. Provide data showing product and hardware of proposed substitution are equivalent to better than specified product.
      b. Provide sample of items to be considered for review by the Architect. Samples will be returned.

B. Product: Dimensional Letters - Fabricated Metal Letters, non-illuminated.
   1. Letter Style: As noted on A12 series drawings
   2. Text: As indicated on the drawings
   3. Letter Height: As indicated on the drawings
   4. Locations: East side of weight room and South side of PEMB
   5. Thickness:
      a. Letter thickness As indicated on the drawings
      b. Material thickness 1/16 inch minimum
   6. Material: Aluminum
   7. Mounting Method: Refer to A12 series drawings for mounting information.
   8. Color: Painted, selected from manufacturer's standard colors
   9. Fabrication
      a. Design, fabricate, and install sign assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners.
      b. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.
      c. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
      d. Create signage to required sizes and layout. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.

C. Dimensional Letters - Cut ACM Metal Letters
   1. Letter Style: As noted on A12 series drawings

2. Text: As indicated on the drawings
3. Letter Height: As indicated on the drawings
4. Material: Aluminum Composite Metal Panel
5. Mounting Method: Projected mounted holding letters approximately 1 inch from face of wall.
6. Color: As indicated on the drawings
7. Fabrication
    a. Design, fabricate, and install sign assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners.
    b. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.
    c. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
    d. Create signage to required sizes and layout. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.

D. Dimensional Letters - Cut Acrylic Dimensional Letters 3/8" inch thick, non-illuminated, colored acrylic
1. Letter Style:As indicated on A12 drawings
2. Text: As indicated on the drawings
3. Letter Height: As indicated on the drawings
4. Material: 2 layers of 3/8 inch thick acrylic
    a. Black Letters: "GREAT DAY TO BE A" 3/8" Acrylic Letters, Painted Black with Automotive grade paint
    b. Red Letters: "REDSKIN" 3/8" Black acrylic letter mounted to the wall with 3M VHB - 3/8" Mirrored red acrylic applied to the face of the black acrylic with 3M 300 adhesive
5. Mounting Method:
    a. CMU: 3M VHB adhesive
    b. Other Acrylic: 3M 300 adhesive
6. Color: Integrally-Colored Acrylic - selected from manufacturer's standard colors
7. Fabrication
    a. Design, fabricate, and install sign assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners.
    b. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
    c. Create signage to required sizes and layout. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.

2.03 INTERIOR BACK LIT SIGNAGE

A. Manufacturer Basis of Design: Forty Nine Degrees, Coldwater, Ohio specified as the type, size, function and quality of the products required.
1. Acceptable Manufacturers;
    a. Ace Sign Systems Inc., Ft Wayne Indiana
    b. Americraft Co. Inc
    c. ASI Sign Systems, Indianapolis, Indiana: Cleveland, Ohio: Cincinnati, Ohio
    d. Columbus Graphics Inc.
    e. Ellet Sign Company: www.elletneon.com
    f. Forty Nine Degrees, Coldwater, Ohio
    g. Matthews, Pittsburgh, Pennsylvania
2. Substitutions: See Section 01 6000 - Products Requirements

a. Provide data showing product and hardware of proposed substitution are equivalent to better than specified product.
b. Provide sample of items to be considered for review by the Architect. Samples will be returned.

B. Back- Lit Logo
1. Location: Entrance Vestibule
2. Graphic: Design File to be provided by architect
a. Size: As indicated on the drawings
b. Color: As indicated on the drawings
c. Logo:
1) Back: 3/4" White Acrylic, Routed with a channel on the backside for internal halo and edge illumination.
2) Face: .063" Aluminum, Etched and painted with automotive grade paint
d. Lettering: 3/8" Dimensional Acrylic letters mounted on top of the "Redskin Head".
e. Mounting Method:
1) Wall: 2" Barrels mounted to the back wall.
2) Other Acrylic: 3M VHB adhesive
3. Fabrication:
a. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
b. Allow for thermal movement resulting from a maximum ambient temperature change (range) of 100 deg F (38 deg C). Design, fabricate, and install sign assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners.
c. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.
d. Preassemble signs in the shop to the greatest extent possible to minimize field assembly. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in a location not exposed to view after final assembly.
e. Conceal fasteners if possible; otherwise, locate fasteners to appear inconspicuous.
f. Form panels to required size and shape. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.
g. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
h. Increase material thickness or reinforce with concealed stiffeners or backing materials as required to produce surfaces without distortion, buckles, warp, or other surface deformations.

2.04 EXTERIOR BUILDING PANEL SIGNS

A. Manufacturer Basis of Design: Forty Nine Degrees, Coldwater, Ohio specified as the type, size, function and quality of the products required.
1. Acceptable Manufacturers;
a. Ace Sign Systems Inc., Ft Wayne Indiana
b. Americraft Co. Inc
c. Columbus Graphics Inc.
d. Ellet Sign Company: www.elletneon.com
e. Forty Nine Degrees, Coldwater, Ohio
f. Matthews, Pittsburgh, Pennsylvania
2. Substitutions: See Section 01 6000 - Products Requirements

a. Provide data showing product and hardware of proposed substitution are equivalent to better than specified product.
b. Provide sample of items to be considered for review by the Architect. Samples will be returned.

B. Dimensional Letters - Aluminum Composite Metal Panel
1. .125 ACM Direct Printed W/Matte Finish
2. Mounting Method
a. Mechanically Fastened through the face of the letters
3. Panel:
a. Size: As indicate on the drawings. "FL" Logo
b. Location: North side of PEMB

2.05 FABRIC SIGNAGE

A. Manufacturer Basis of Design: Forty Nine Degrees, Coldwater, Ohio specified as the type, size, function and quality of the products required.
1. Acceptable Manufacturers;
a. Ace Sign Systems Inc., Ft Wayne Indiana
b. Americraft Co. IncASI Sign Systems, Indianapolis, Indiana: Cleveland, Ohio: Cincinnati, Ohio
c. Columbus Graphics Inc.
d. Ellet Sign Company: www.elletneon.com
e. Forty Nine Degrees, Coldwater, OhioMatthews, Pittsburgh, Pennsylvania
2. Substitutions: See Section 01 6000 - Products Requirements
a. Provide data showing product and hardware of proposed substitution are equivalent to better than specified product.
b. Provide sample of items to be considered for review by the Architect. Samples will be returned.
3. Stretched Fabric Graphic
a. Face: Direct print fabric graphic
b. Frame: Extruded aluminum frame
1) Finish: Matte Black
c. Size: Indicated on Drawings
d. Mounting Method: Concealed fasteners, standoffs as required on metal liner panel corregations.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 GENERAL INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs and letters level and plumb.

C. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance

D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.

3.03 DIMENSIONAL LETTERS

A. Locate lettering where indicated on drawings.

B. Install neatly, with horizontal edges level.

C. Confirm attachement to surface during submittal process.

3.04 CLEANING AND PROTECTION

A. Clean exposed surfaces. Remove construction and installation marks.

B. Remove temporary coverings.

C. Protect installed signs from subsequent construction operations.

END OF SECTION 10 14 19

SECTION 10 14 20
VINYL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vinyl applied lettering

B. Window Perforated Vinyl - Locker Room Building

1.02 RELATED SECTIONS

A. Section 01 60 00 - Products Requirements

B. Section 07 24 00 - Exterior Insulation and Finish System

C. Section 04 20 00 - Unit Masonry.

1.03 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. See Section 01 6116 VOC Content Restrictions, for VOC submittal procedures

C. 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.

D. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

E. Samples:
   1. Submit one (1) sample building letter, room/occupancy sign shown construction, text style, etc.
   2. Submit one sample other signs required, of size not less than 10 inches by 12 inches similar to that required for project, illustrating sign style, font, and method of attachment.
   3. Sample will be returned to contractor.

F. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

G. Verification Samples: Submit samples showing colors specified not less than 10 inches by 12 inches.

H. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to OBBC code and ANSI A117.1 for requirements for the physically handicapped.

B. Signage shall conform to with the Americans with Disabilities Act Accessibility Guidelines (ADAAG). These requirements supersede Technical Specifications in this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 6000 - Product Requirements.

B. Store adhesive attachment tape at ambient room temperatures.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs 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 REFER TO A12 SERIES DRAWINGS FOR SIGNAGE MATERIALS, LAYOUT AND LOCATIONS

2.02 INTERIOR GRAPHICS LETTERS

A. Manufacturer Basis of Design: Forty Nine Degrees, Coldwater, Ohio specified as the type, size, function and quality of the products required.
   1. Ace Sign Systems Inc., Ft Wayne Indiana
   2. Americraft Co. Inc
   3. ASI Sign Systems, Indianapolis, Indiana: Cleveland, Ohio: Cincinnati, Ohio
   4. Columbus Graphics Inc.
   5. Ellet Sign Company: www.elletneon.com
   6. Forty Nine Degrees, Coldwater, Ohio
   7. Matthews, Pittsburgh, Pennsylvania
   8. Substitutions: See Section 01 6000 - Products Requirements
      a. Provide data showing product and hardware of proposed substitution are equivalent to better than specified product.
      b. Provide sample of items to be considered for review by the Architect. Samples will be returned.

B. Product: 3M Control TAC vinyl
   1. Letter Style: As indicated on A12 series drawings
   2. Text: As indicated on the drawings
   3. Letter Height: As indicated on the drawings
   4. Material: Vinyl
   5. Mounting Method: Adhesive to painted CMU
   6. Color: Painted, selected from manufacturer's standard colors
   7. Fabrication
      a. Create signage to required sizes and layout. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.

2.03 WINDOW VINYL TREATMENT - LOCKER ROOM

A. Manufacturer Basis of Design: Forty Nine Degrees, Coldwater, Ohio specified as the type, size, function and quality of the products required.
   1. Acceptable Manufacturers;
      a. Ace Sign Systems Inc., Ft Wayne Indiana
      b. Americraft Co. Inc
      c. ASI Sign Systems, Indianapolis, Indiana: Cleveland, Ohio: Cincinnati, Ohio

d. Columbus Graphics Inc.
e. Ellet Sign Company: www.elletneon.com
f. Forty Nine Degrees, Coldwater, Ohio
g. Matthews, Pittsburgh, Pennsylvania

2. Substitutions: See Section 01 6000 - Products Requirements
   a. Provide data showing product and hardware of proposed substitution are equivalent to better than specified product.
   b. Provide sample of items to be considered for review by the Architect. Samples will be returned.

B. Adhesive Backed Perforated Window Treatment
1. Opacity: 80/20 perforated window treatment
2. Location: Locker Room Storefront and Existing Windows
   a. Size: As indicated on the drawings
   b. Graphic: As indicated on drawings, design file to be provided by architect.
3. Color: Multiple Colors as indicated on drawings

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 GENERAL INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs and letters level and plumb.

C. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance

D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.

3.03 CLEANING AND PROTECTION

A. Clean exposed surfaces. Remove construction and installation marks.

B. Remove temporary coverings.

C. Protect installed signs from subsequent construction operations.

END OF SECTION 10 14 20

SECTION 10 14 53
TRAFFIC SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Traffic Sign

1.02 RELATED SECTIONS

A. Section 01 60 00 - Products Requirements

B. Section 04 20 00 - Unit Masonry.

1.03 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People.

1.04 SUBMITTALS

A. See Section 01 30 00 - 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. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to OBBC code and ANSI A117.1 for requirements for the physically handicapped.

B. Signage shall conform to with the Americans with Disabilities Act Accessibility Guidelines (ADAAG). These requirements supersede Technical Specifications in this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 6000 - Product Requirements.

B. Store adhesive attachment tape at ambient room temperatures.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs 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 REFER TO A12 SERIES DRAWINGS FOR SIGNAGE MATERIALS, LAYOUT AND LOCATIONS

2.02 TRAFFIC SIGNS

A. Manufacturer
   1. Sign International, Inc. www.signinternational.com

B. Acceptable Manufacturers
   1. Ara Signs www.arasigns.com
   2. Ellet Sign Company: www.elletneon.com
   3. Grimco Inc. www.grimco.com
   4. Interwest Safety Supply Inc.

5. Substitutions: See Section 01 60 00 - Product Requirements

C. Regulatory: Signs to meet the Ohio Department of Transportation standards.

D. Signs
   1. Handicapped Parking: As detailed on the drawings

E. Materials
   1. 0.080 Aluminum
   2. Engineer Grade Reflective Sheeting
   3. Non Corrosive 3/8" Machine Bolts with washers (2) per sign.

F. Mounting Post
   1. 2" x 2" square 16 gauge

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 GENERAL INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs and letters level and plumb.

C. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance

D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.

3.03 TRAFFIC SIGNS

A. Install signs in accordance with manufacturer's instructions.

B. Sign Posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have a diameter 4 times greater than outside dimension of post, and depths approximately 6 inches deeper than frost level. Set post bottom 33 inches below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour, tamp for consolidation. Trowel finish around post and slope to direct water away from posts. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

C. Install signs horizontal, level, and plumb.

3.04 CLEANING AND PROTECTION

A. Clean exposed surfaces. Remove construction and installation marks.

B. Remove temporary coverings.

C. Protect installed signs from subsequent construction operations.

END OF SECTION 10 14 53

SECTION 10 14 67
TACTILE SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and Occupancy Signs

B. Restroom Signs

C. Dedication Plaque

1.02 RELATED SECTIONS

A. Section 01 60 00 - Products Requirements

1.03 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Garmann/Miller & Associates Inc.Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Garmann/Miller & Associates Inc.Architect prior to fabrication.

D. Samples:
   1. Submit one (1) sample building letter, room/occupancy sign shown construction, text style, etc.
   2. Submit one sample other signs required, of size not less than 10 inches by 12 inches similar to that required for project, illustrating sign style, font, and method of attachment.
   3. Sample will be returned to contractor.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors specified not less than 10 inches by 12 inches.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to OBBC code and ANSI A117.1 for requirements for the physically handicapped.

B. Signage shall conform to with the Americans with Disabilities Act Accessibility Guidelines (ADAAG). These requirements supersede Technical Specifications in this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 6000 - Product Requirements.

B. Store adhesive attachment tape at ambient room temperatures.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs 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 REFER TO A12 SERIES DRAWINGS FOR SIGNAGE MATERIALS, LAYOUT AND LOCATIONS

2.02 ROOM, RESTROOM AND OCCUPANCY SIGNS

A. Manufacturer Basis of Design: Forty Nine Degrees, Coldwater, Ohio specified as the type, size, function and quality of the products required.
   1. Ace Sign Systems Inc., Ft Wayne Indiana
   2. ASI Sign Systems, Indianapolis, Indiana: Cleveland, Ohio: Cincinnati, Ohio
   3. Columbus Graphics Inc.
   4. Ellet Sign Company: www.elletneon.com
   5. Matthews, Pittsburgh, Pennsylvania
   6. Substitutions: See Section 01 6000 - Products Requirements
      a. Provide sample of items to be considered for review by the Architect. Samples will be returned.

B. Product: Acrylic w/ subsurface Graphic Sign.
   1. Material: 1/8" acrylic backer. 1/8" non glare acrylic w/ second surface applied digital graphic.
   2. Graphic Process: Tactile letters and braille achieved through Raster process. Surface applied letters and braille are not permitted.
   3. Letters: Letters and numbers shall be raised 1/32inch from sign face. All text shall be accompanied by Grade 2 Braille.
   4. Background Color: To be selected from manufacturers standard colors.
   5. Text, Symbol and Character Color: To be selected from manufacturers standard colors.
   6. Sign Text:
      a. Toilet Room Handicapped Sign: International Men/Women Symbol, accessibility symbol, text "Men" or "Women" and Grade 2 Braille.
      b. Interior Room Name and Number Sign: Refer to drawings for font style and size and lettering alignment.

2.03 RESTROOM SIGNS

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 GENERAL INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs and letters level and plumb.

C. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance

D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.

3.03 CLEANING AND PROTECTION

A. Clean exposed surfaces. Remove construction and installation marks.

B. Remove temporary coverings.

C. Protect installed signs from subsequent construction operations.

END OF SECTION 10 14 67

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Door and frame protection.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking for wall and corner guard anchors.

B. Section 08 71 00 - DO NOT USE - Door Hardware: Standard protection plates and trim.

C. Section 09 21 16 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

D. Section 09 22 16 - Non-Structural Metal Framing: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2014.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two sections of corner guards, bumper rails, and protective corridor handrails, 24 inches long.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

G. Maintenance Data: For each type of product . Include information regarding recommended and potentially detrimental cleaning materials and methods.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PRODUCT TYPES

A. Wall End Protection:
   1. See Section 08 71 00 - DO NOT USE - Door Hardware for standard protective plates and trim.

2. Edge Protection: Provide along edge of opening to protect from damage as objects are moved through door opening.
3. Frames Protection: Formed to fit opening profile.
    a. Material: High-impact acrylic-modified vinyl.
    b. Profile: One-piece.
    c. Configuration: For flush frames.
    d. Thickness: 0.040 inch.
    e. Height: 108 inches.
    f. Color: As selected from manufacturer's standard colors.
    g. Mounting: fasteners.

2.02 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

3.02 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

3.03 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION 10 26 00

SECTION 10 26 23
PROTECTIVE WALL COVERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor; 2013a.

C. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2017.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.04 SUBMITTALS

A. See Section 01 30 00 - 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 12 by 12 inch in size illustrating material and surface design of panels.

1.05 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:
   1. Marlite; Artizan Collection: www.marlite.com.
   2. Acceptable Manufacturers:
      a. Crane Composites, Inc: www.cranecomposites.com.
      b. Inpro Corp, www.inprocorp.com
      c. Nudo: www.nudo.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels Fiberglass Reinforced Panel, FRP:
   1. Panel Size: 4 by 8 feet.
   2. Panel Thickness: 0.10 inch.
   3. Surface Design: Embossed.
   4. Color: As selected by Architect.
   5. Attachment Method: Mechanical fasteners concealed by trim, with sealant in joints and sealants behind majority of panel.

6. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
    a. Coating: Multi layer print, primer and finish coats.
    b. Dimensions:
        1) Thickness - 0.090 inch (2.29mm) nominal
        2) Width - 4'-0" (1.22m) nominal
        3) Length - As indicated on the drawings.
    c. Tolerance:
        1) Length and Width: +/-1/8 inch (3.175mm)
        2) Square - Not to exceed 1/8 inch for 8 foot (2.4m) panels or 5/32 inch (3.96mm) for 10 foot (2.4m) panels
    d. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
        1) Flexural Strength - 1.0 x 104 psi per ASTM D 790. (7.0 kilogram-force/square millimeter)
        2) Flexural Modulus - 3.1 x 105 psi per ASTM D 790. (217.9 kilogram-force/square millimeter)
        3) Tensile Strength - 7.0 x 103 psi per ASTM D 638. (4.9 kilogram-force/square millimeter)
        4) Tensile Modulus - 1.6 x 105 psi per ASTM D 638. (112.5 kilogram-force/square millimeter)
        5) Water Absorption - 0.72% per ASTM D 570.
        6) Barcol Hardness (scratch resistance) of 35 55 as per ASTM D 2583.
        7) Izod Impact Strength of 72 ft. lbs./in ASTM D 256
7. Manufacturers: Refer to "Finish Material Schedule" on drawing A9.0.

2.03 MATERIALS

A. Trim: Aluminum; color coordinating with panel. Unless noted otherwise on drawings.

B. Fasteners: Glue on backside of panel. Minimal use of exposed fasteners is desired. .

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Type recommended by panel manufacturer; color matching panel.

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. Pre-drill fastener holes in panels, 1/8 inch greater in diameter than fastener, spaced as indicated by panel manufacturer.

D. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

E. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

F. Install panels with manufacturer's recommended gap for panel field and corner joints.

G. Drive fasteners to provide snug fit, and do not over-tighten.

H. Place trim on panel before fastening edges, as required.

I. Fill channels in trim with sealant before attaching to panel.

J. Install trim with adhesive and screws or nails, as required.

K. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

L. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION 10 26 23

SECTION 10 28 00
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Accessories for toilet rooms.

C. Grab bars.

D. Installation of accessories supplied by owner.

1.02 RELATED REQUIREMENTS

A. Section 10 21 13.19 - Plastic Toilet Compartments.

B. Section 26 05 76 - Hair Dryers/Hand Dryers: Electric hand dryers.

1.03 REFERENCE STANDARDS

A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

C. ASTM C1036 - Standard Specification for Flat Glass; 2021.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Keys: Master keys to lockable accessories

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Bobrick Washroom Equipment Inc..

B. Commercial Toilet, Shower, and Bath Accessories:
   1. AJW Architectural Products: www.ajw.com.
   2. American Specialties, Inc: www.americanspecialties.com.
   3. Bradley Corporation: www.bradleycorp.com.
   4. Georgia-Pacific Professional: www.blue-connect.com.
   5. Substitutions: Section 01 60 00 - Product Requirements.

C. Provide products of each category type by single manufacturer.

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.
   1. Provide vandal-resistant fasteners and anchors
   2. Grind welded joints smooth.
   3. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide 1 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

F. Adhesive: Two component epoxy type, waterproof.

G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

A. See Toilet Accessory Schedule on the drawings

B. TA1; Grab Bars
   1. Stainless steel, nonslip grasping surface finish.
   2. Push/Pull Point Load: 250 pound-force, minimum.
   3. Dimensions: 1 1/2" inch outside diameter, minimum 22 gage wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
   4. Length and Configuration: As indicated on drawings.
   5. Product: B-6806 Series manufactured by Bobrick.

C. TA2.; Mirrors
   1. Stainless steel framed, 6 mm thick tempered glass mirror.
   2. Frame: 3/4 x 3/4 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
   3. Size and Configuration: As indicated on drawings.
   4. Product: B-2908 Series manufactured by Bobrick.

D. TA3.2; Toilet Paper Dispenser (Owner Furnished, Owner Installed)
   1. Shown on drawings for location purposes only

E. TA4.1; Sanitary Napkin Disposal Unit
   1. Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
   2. Product: B-254 manufactured by Bobrick.

F. TA5.1; Soap Dispenser (Owner Furnished, Owner Installed)
   1. Shown on drawings for location purposes only

G. TA6.1 Paper Towel Dispenser: (Owner Furnished, Owner Installed)
   1. Shown on drawings for location purposes only

H. TA7.1; Robe Hook

1. Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
2. Product: B-76717 manufactured by Bobrick.

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.

D. See Section 06 1000 for installation of blocking, reinforcing plates, and concealed anchors in walls.

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. Refer to A0.2 Drawing for mounting heights and locations.

B. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

C. Install accessories with vandal-resistant fasteners.

D. Install plumb and level, securely and rigidly anchored to substrate.

E. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 28 00

SECTION 10 41 16
EMERGENCY KEY CABINETS

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. High-Security key lock box cabinet, accessories and their installation.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 04 20 00- Unit Masonry

C. Division 26 - Electrical

D. Division 28 - Fire Alarm System

1.03 REFERENCES

A. UL 437 - Standard for Key Locks

B. UL 1037 - Standard for Anti-Theft Alarms and Devices

C. UL 1332 - Standard for organic coatings for steel enclosures for outdoor use.

D. UL 1610 - Standard for central station burglar alarm units

E. NFPA. OFC, IBC

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Small-scale plans showing details of key lock box cabinet.

C. Product Data: Materials description for key lock box cabinet include roughing-in dimensions, details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, door style and materials.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.05 DELIVERY, STORAGE & HANDLING

A. Deliver materials in manufacturer's original packaging with identification labels intact.

B. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

C. Remove from site and dispose of packaging materials at appropriate recycling facilities.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturer: Knox Company
   1. 1601 W. Deer Valley Rd
   2. Phoenix, AZ 85207
   3. P: 1-800-552-5669
   4. www.knoxbox.com

B. Basis of Design - Knoxbox 3200

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 HIGH - SECURITY KEY LOCK BOX

A. Mounting Type: Recessed

B. Finish: Fire resistant finish.

C. Color: Black

D. Capacity: 10 keys and Key Fob.

E. Cabinet Construction: 1/4 inch plate steel fully welded.

F. Exterior Dimensions:
   1. Cabinet Body: 4 inches high x 5 inches wide x 3 7/8 inches deep
   2. Recessed Mount Flange: 7 inches wide x 7 inches high

G. Door Construction: 1/2 inch thick steel.

H. Weather-Resistant door gasket.

I. Stainless Steel door hinge.

J. 1/8 inch thick stainless steel dust cover for over keyed lock area.

2.03 ACCESSORIES

A. Provide 4 key tags and key rings.

B. Provide 1 - Tag - Out Tamper Seal.

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 PREPARATION

A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of key cabinet materials.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Arrangement of Equipment: Arrange equipment so that removal for repairs or replacement does not require undue dismantling or removing of other equipment components.

C. Coordinate key lock box cabinet work with work of other trades for proper time and sequence to avoid construction delays.

D. Coodinate keying with Fort Loramie Fire Department

3.04 ADJUSTMENT

A. Be sure that the lock functions smoothly and the door opens easily.

3.05 CLEANING

A. Upon completion, remove surplus and excess materials, rubbish, tools and equipment.

3.06 PROTECTION

A. Protect installed products from damage during construction in accordance.

END OF SECTION 10 41 16

SECTION 10 43 13
DEFIBRILLATOR CABINETS

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Defibrillator cabinets, accessories and their installation.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 04 20 00- Unit Masonry

1.03 REFERENCES

A. American National Standards Institute/National Fire Protection Association (ANSI/NFPA):
   1. ANSI/NFPA 10 Portable Fire Extinguishers.

B. American Heart Association (AHA):
   1. 2005 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Small-scale plans showing locations of defibrillator cabinets.

C. Product Data: Materials description for defibrillator cabinets include roughing-in dimensions, details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, door style and materials.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.05 DELIVERY, STORAGE & HANDLING

A. Deliver materials in manufacturer's original packaging with identification labels intact.

B. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

C. Remove from site and dispose of packaging materials at appropriate recycling facilities.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturer: JL Industries, Inc.; Product 1414

B. Acceptable Manufacturers:
   1. Larsen's Manufacturing Co: www.larsensmfg.com.
   2. Potter-Roemer: www.potterroemer.com.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 AUTOMATIC EXTERNAL DEFIBRILLATOR (AED) CABINETS

A. Style: Interior, Semi-Recessed

B. Steel with electrostatic white impact resistant powder coat finish.

C. Door Style: Full acrylic with vandal resistant handle, concealed hinges, pull and AED Graphics.

D. Tub: Steel with impact resistant white epoxy coating.

E. Semi- Recessed cabinet 3-inch rolled edged.

2.03 ACCESSORIES

A. Vandal Resistant Handle: Cam style locking device.
   1. Acceptable Material: JL Industries, Inc., SAF-T-LOK.

B. Cabinet Seal:
   1. Acceptable Material: JL Industries, Inc., SAF-T-CLASP.

C. Alarm: Ensure 85 dB horn sounds for 2 minutes minimum when door is opened and stops when door closes.
   1. Keyed Alarm: On/Off.
   2. Horn Power: 9 Volt DC battery, with low power indicator.
      a. Provide and install batteries at time of Substantial Completion.

D. Identify defibrillator cabinets in accordance with silk screen print on inside of acrylic

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 PREPARATION

A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of defibrillator cabinet materials.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install defibrillator cabinets as indicated.

C. Arrangement of Equipment: Arrange equipment so that removal for repairs or replacement does not require undue dismantling or removing of other equipment components.

D. Coordinate defibrillator cabinet work with work of other trades for proper time and sequence to avoid construction delays.

E. Install batteries at time of substantial completion.

3.04 ADJUSTMENT

A. Adjust defibrillator cabinet doors to achieve smooth operation.

3.05 CLEANING

A. Upon completion, remove surplus and excess materials, rubbish, tools and equipment.

3.06 PROTECTION

A. Protect installed products from damage during construction in accordance.

END OF SECTION 10 43 13

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Exterior fire extinguisher cabinets.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry

B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

C. Product Data: Provide extinguisher operational features.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.05 REGULATORY REQUIREMENTS

A. Fire extinguishers are required to be tagged and punched by an indvidual licensed in the State of Ohio.

1.06 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. JL Industries, Inc: www.jlindustries.com.
   2. Larsen's Manufacturing Co: www.larsensmfg.com.
   3. Potter-Roemer: www.potterroemer.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. JL Industries, Inc: www.jlindustries.com.
   2. Larsen's Manufacturing Co: www.larsensmfg.com.
   3. Potter-Roemer: www.potterroemer.com.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Stored Pressure Operated: Deep Drawn.
   2. Class: A:B:C type.
   3. Size: 10 pound.
   4. Finish: Baked polyester powder coat red color.
   5. Temperature range: -65 degrees F to 120 degrees F.
   6. Location: All locations unless otherwise indicated

2.03 FIRE EXTINGUISHER CABINETS

A. FEC-S, Product 2409-6R Larsen Manufacturing Co., Architectural Series, Steel cabinet, Semi Recessed with 2 1/2 inch projection, Vertical Duo Panel with frame door with tempered glass.

B. FEC-R, Product 2409-R2 Larsen Manufacturing Co., Architectural Series, Steel cabinet, Fully Recessed, Full Solid Door with 'Fire Extinguisher' decal in black letters.

C. Accessibility: Cabinet, door and accessories to ADA compliant.

D. Metal: Formed steel.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

F. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

G. Finish of Cabinet Interior: White colored enamel.

2.04 EXTERIOR FIRE EXTINGUISHER CABINET

A. Fire Extinguisher Cabinet, Product FB Series Fiberglass Fire Extinguisher Cabinet, JL Industries.

B. Tub and door are constructed of fiberglass with full rubber-gasketed door, 6" x 9" acrylic view window with rubber gasket seal, corrosion-resistant aluminum handle, a full-length stainless steel hinge attached by rivets, and (2) stainless steel snap latches.

C. Finish: UV-resistant, high-visibility red finish with 5" x 9" Fire Extinguisher Lettering.

2.05 ACCESSORIES

A. Cabinet Signage: "FIRE EXTINGUISHER" decal in black letters.
   1. Provide signage on front of cabinet.
   2. Provide signage on side of cabinet (semi recessed and surface mounted) with a cabinet exposure of 2 1/2 inches or greater.

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 brackets on walls. Reference drawings for mounting heights and also coordinate with requirements on authorities having jurisdiction.

C. Install cabinets plumb and level in wall openings. Reference details on drawings and coordinate with requirements of authorities having jurisdiction to confirm mounting heights and cabinet locations.

D. Secure rigidly in place.

E. Place extinguishers in cabinets and on wall brackets.

3.03 ADJUSTMENT

A. Adjust cabinet doors to achieve smooth operation.

3.04 CLEANING

A. Clean all surfaces.

B. Upon completion, remove surplus and excess materials, rubbish, tools and equipment.

3.05 PROTECTION

A. Protect installed products from damage during construction in accordance.

END OF SECTION 10 44 00

SECTION 10 51 13
METAL LOCKERS AND BENCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal Welded Lockers
   1. Sheet Metal Lockers

B. Locker Benches.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking and nailers.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicated on locker plan layout, numbering plan.

D. Samples: Submit two samples 3 by 6 inches in size, of each color scheduled.

E. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. 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. ASI Storage Solutions: www.asi-storage.com.
   3. List Industries: www.listindustries.com
   4. Lightning Lockers: www.lightninglockers.com
   5. Lyon Workspace Products: www.lyonworkspace.com
   6. Penco Products, Inc: www.pencoproducts.com
   7. Republic Storage Systems Co: www.republicstorage.com
   8. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Steel: Prime grade mild cold-rolled sheet steel free from surface imperfection, capable of taking a high-grade enamel finish and in compliance with ASTM A1008/A1008M.

B. Hooks: Zinc plated forged steel, ball ends.

C. Bolts and Nuts: Zinc plated truss fin head bolts and hex nuts.

2.03 LOCKER DEFINITIONS

A. Metal locker definitions. Reference drawings for location, dimensions and configuration.

1. Welded locker definitions:
    a. LMWO - **L**ocker **M**etal **W**elded **O**pen (No Door)

2.04 LOCKER APPLICATIONS

A. WELDED LOCKERS
1. Locker Applications:
    a. Open-Front Athletic Lockers. Located in Football Locker Room 108 (Locker Room Building)

2.05 METAL WELDED LOCKERS

A. Open-Front Athletic Lockers: Metal lockers, free-standing with matching closed base.
1. Width: 24 inches.
2. Depth: 24 inches .
3. Height: 72 inches.
4. Configuration: Single tier.
5. Fittings: Size and configuration as indicated on drawings.
    a. Upper shelf.
    b. Lock box.
    c. Coat rod.
    d. Hooks: Two single prong.
    e. Footlocker with hinged top/seat.
    f. LED lighting - reference electrical drawings
6. Ventilation: Perforated side panels.
7. Color: To be selected from manufacturer's full range by Architect.

2.06 INTERIOR EQUIPMENT

A. ADA-Compliant Lockers:
1. Single Tier Lockers: Hat shelf at maximum 48 inches (1.219 m) off the floor for unobstructed forward and side reach.
2. Locker Compartment Bottom: Minimum of 15 inches (230 mm) off the floor, or an extra shelf placed 15 inches (381 mm) off the floor for unobstructed forward and side reach.
3. Handicapped symbol attached to door.
4. Hooks and rods as specified for other lockers.

B. Stadium Open-Front Athletic Lockers:
1. Full width shelf, coat rod, and two single prong hooks.
2. Box locker security box, above shelf.
    a. Door shall be 14 gauge steel, punched for built-in lock or padlock. Lock hole cover with door pull shall be provided for padlock use.
    b. Hinges: 16 gauge continuous and riveted to 16 gauge welded frame
    c. Side panel: 16 gauge
3. Foot locker with hinged bench seat, padlock hasp and stainless steel strike.
    a. Hinge: 16 gauge continuous and riveted to horizontal panel
    b. Ventilation: Front panel to have a pattern of mini louvers that measure ½" (12.7 mm) wide by ¼" (6.35 mm) high.

2.07 ACCESSORIES

A. This section includes accessories for knock-down and welded sheet meal lockers only.
1. Continuous Sloped Hoods: 18 gauge (0.0478 inch) steel, slope rise equal to 1/3 of the locker depth (18.5 degrees), plus a 1 inch (25 mm) vertical rise at front.
    a. Slip joints without visible fasteners at splice locations.
    b. Provide necessary end closures.

c. Finish to match lockers.

2. Finished End Panels: Minimum 16 gauge steel formed to match locker depth and eight, 1 inch (25 mm) edge dimension; finish to match lockers and install with concealed fasteners.
3. Front Fillers: 20 gauge steel formed in an angle shape, with 20 gauge slip joint angles formed in an angle shape with double bend on one leg forming a pocket to provide adjustable mating with angle filler.
   a. Attachment by means of concealed fasteners.
   b. Finish to match lockers.
4. Coat Hooks: Stainless steel or zinc-plated steel with ball ends.
   a. Provide each locker with two single-prong wall hooks and one double-prong rear hook.
5. Number Plates: Provide each locker with a polished aluminum number plate, 2-1/4 inches (57 mm) wide by 1 inch (25 mm) high, with black numerals not less than 3/8 inch (9.5 mm) high; attach to face of door with two aluminum rivets.
6. Locking: Equipped for padlock hasps.
7. Benches: Laminated selected hardwood, 1-1/4 inch (31 mm) full finished thickness, corners rounded and sanded, surfaces finished with two coats of clear lacquer. Reference drawings for locations and dimensions.

2.08 PEDASTAL BENCHES

1. Benches: Laminated selected hardwood, 1-1/4 inch (31 mm) full finished thickness, corners rounded and sanded, surfaces finished with two coats of clear lacquer. Reference drawings for locations and dimensions.
   a. Width: 24 inches (610 mm) wide.
   b. Lengths: Reference drawings.
   c. Heavy-Duty Bench Pedestals: Steel tubing with 11 gauge steel flanges welded to each end, 16-1/4 inches (412 mm) high, finish to match lockers.

B.

2.09 FABRICATION

A. This section includes accessories for knock-down and welded sheet meal lockers only.
   1. Fabricate lockers square, rigid, without warp, with metal faces flat and free of distortion.
   2. Knock-Down Lockers: Fabricate lockers on the unit principle, each locker with individual door and frame, individual top, bottom, back, and shelves, with common intermediate divisions separating compartments. Verify dimensions and arrangement before fabrication.
   3. Welded Lockers: Pre-assemble lockers by welding into one piece structures in groupings most practical for job requirements, welds free of burrs; maximum width of group to be 54 inches (1.371m); no bolts, nuts or rivets allowed in assembly of main locker groups.

2.10 FINISH

A. Enamel powder coat paint finish electrostatically applied.

B. Locker exterior and interior shall be painted the same color.

C. Powder Coat - Dry Thickness: 1 to 1.2 mils (0.025 to 0.03 mm).

D. Color: As selected from manufacturer's standard colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. If substrate and bases are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Locker recess into wall openings shall be centered in opening with equally sized filler panels on each side. (no center filler panels)

C. Install lockers plumb, level, and square.

D. Place and secure on prepared base.

E. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb.

F. Bolt adjoining locker units together to provide rigid installation.

G. Install end panels, filler panels, and sloped tops. Provide flush hairline joints against adjacent surfaces.

H. Install accessories.

I. Replace components that do not operate smoothly.

J. Install benches by fastening bench tops to pedestals and securely anchoring to the floor using appropriate anchors for the floor material.

3.03 ADJUSTING

A. Adjust doors and latches to operate without binding. Verify that latches are operating satisfactorily.
   1. Replace components that do not operate smoothly.

B. Touch-up with factory-supplied paint and repair or replace damaged products before substantial completion.

3.04 CLEANING

A. Clean locker interiors and exterior surfaces.

3.05 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION 10 51 13

SECTION 10 82 00
LOUVER MECHANICAL FENCE

PART 1 - GENERAL:

1.01 SECTION INCLUDES

A. Fabricated extruded aluminum fence (screens)

B. Provide frames, supports, girts, fasteners, metal flashings, and metal trim associated with metal fence (screen) to provide a complete system.

C. Swing Gates.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast in Place Concrete

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

B. AAMA 612 - Voluntary Specification, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum; 2002.

C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performance Organic Coatings on Aluminum Extrusions and Panels - American Architectural Manufacturers Association; 2011

D. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 6000 Tensile Strength; 2010.

E. ASTM A792/A792M - Steel Sheet, 55% Aluminum-Zinc Alloy Coated by Hot Dip Process; 2010.

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

H. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs; 2002 (Reapproved 2008).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Submit detailed shop drawings, showing all profiles, sections of all components, finishes, fastening details, and manufacturer's technical and descriptive data. Include field dimensions of openings and elevations on shop drawings.

C. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

D. Samples: 10 inches by 10 inches minimum illustrating design, workmanship and finish color.

1.05 QUALITY ASSURANCE

A. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with no less than five years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section.
   1. With minimum five years of documented experience.
   2. Approved by manufacturer.

1.06 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Sun Screens: Correct defective work within a five year period after date of Substantial Completion.

C. Finish Warranty: Provide ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Manufacturer:
   1. OGi Architectural Metal Solutions; www.ohiogratings.com; Product, VisiBlock GL100

B. Acceptable Manufacturers
   1. Ametco Manufacturing Inc.
   2. American Fence Company
   3. Substitutions: See Section 01600 - Product Requirements.

2.02 MATERIALS:

A. Aluminum extrusions: ASTM B 211, Alloy 6063-T6.

B. Clip Angles: Structural grade aluminum.

C. Fastenings: Fasteners shall be aluminum or stainless steel. Provide types, gauges and lengths to suit unit installation conditions.

D. Anchors and Inserts: Use non-ferrous metal or hot-dip galvanized anchors and inserts for installation and elsewhere as required for corrosion resistance. Use stainless steel or lead expansion bolt devices for drilled-in place anchors.

E. Furnish inserts, as required, to be set into concrete or masonry work.

2.03 FABRICATION, GENERAL:

A. Provide Screen and accessories of design, materials, sizes, depth, arrangement, and metal thickness as indicated

B. Include supports, anchorages, and accessories required for complete assembly.

2.04 SCREEN CONSTRUCTION:

A. Blades to be fabricated from extruded aluminum sections in 6063-T52 alloy, place horizontally with 100% visual block.

B. Aluminum supports fixed directly to supports with extruded aluminum clip angles. All fasteners to be stainless steel or aluminum.

2.05 GATES

A. Provide gates of type and size indicated on Drawings. Equip gates with manufacturer's standard hardware as required for complete functional operation.

B. Type: Hinged swinging double gate.
   1. Construction: Welded frame fabricated from aluminum tubing with open grille aluminum panels to match screen material.
   2. Hardware:
      a. Hinges: Size and type as determined by manufacturer. Provide 2 hinges for each leaf up to 6 feet high and 1 additional hinge for each additional 24 inches in height or fraction thereof.
      b. Latch: 3/4 inch diameter slide bolt to accommodate padlock.

2.06 ALUMINUM FINISH:

A. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated.

B. Apply finishes in factory after products are assembled. Protect finishes on exposed surfaces prior to shipment.

C. Remove scratches and blemishes from exposed surfaces which will be visible after completing finishing process.

D. Color: As selected by Architect from manufacturers standard line.

PART 3 - EXECUTION:

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

C. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.02 INSTALLATION

A. Install screens in accordance with reviewed product data, final shop drawings, as indicated on the Drawings, and manufacturer's specifications and recommendations.

B. Do not install component parts which are observed to be defective in any way, including, but not limited to, warped, bowed, dented, damaged edges, and abraded and broken members.

C. Do not cut or trim component parts during erection, in a manner which would damage the finish, decrease the strength, or result in a visual imperfection.

D. Install component parts level, plumb, true-to-line and with uniform joints and reveals. Secure to structure with non-staining and non-corrosive shims, anchors, fasteners, spacers, and fillers. Use erection equipment which shall not mar or stain finished surfaces, and shall not damage the component parts.

E. Anchor component parts securely in place as shown, by bolting or other permanent mechanical attachment system, which shall comply with performance requirements.

F. Protect galvanized and non-ferrous metal surfaces from corrosion or galvanic action by applying a heavy coating or bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Install gates and adjust hardware for smooth operation.

3.03 CLEANING AND ADJUSTING

A. Cleaning: Remove temporary protective coverings and strippable films (if any) as each panel is installed. Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer, and maintain in a clean condition during construction.

B. Damaged Units: Replace panels and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures.

3.04 PROTECTION

A. Provide final protection and maintain conditions that shall ensure that the screens shall be without damage at time of Substantial Completion.

END OF SECTION 10 82 00

SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

B. Section 10 28 00 - Toilet Accessories.

1.03 REFERENCE STANDARDS

A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

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 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Product Data: Provide data on panel construction, hardware, and accessories.

D. Samples: Submit two samples of partition panels, 6 inch by 6 inch in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:
   1. ASI Accurate Partitions: www.accuratepartitions.com
   2. Hadrian, Inc, www.hadrian-inc.com
   3. Inpro: www.inprocorp.com
   4. Metpar Corp: www.metpar.com
   5. Partition Systems International of South Carolina; PolyLife HDPE Toilet Partitions: www.psisc.com
   6. Scranton Products (Santana/Comtec/Capital): www.scrantonproducts.com
   7. Substitutions: Section 01 60 00 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286, floor-mounted headrail-braced.
   1. HDPE resins to be tested in accordance with NFPA 286.
   2. Polyethylene (HDPE) resins. Partitions shall be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, non-

absorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments.
3. All plastic components shall be covered with a protective plastic masking.
4. Color: as selected by Architect from manufacturers standard line.

B. Doors:
1. Thickness: 1 inch.
2. Width:
a. Standard stall, less than 6'-0" deep: 24 inches.
b. Standard stall, 6'-0" and more deep: 30 inches.
c. Wheelchair accessible stall: 34 inch, out-swinging.
d. Ambulatory accessible stall: 34 inch, out-swinging.
3. Height: 55 inch. (nominal -manufacturer standard height)

C. Panels:
1. Thickness: 1 inch.
2. Height: 55 inch. (nominal - manufacturer standard height)
3. Depth: As indicated on drawings.

D. Pilasters:
1. Thickness: 1 inch.
2. Width: As required to fit space; minimum 3 inch.

E. Urinal Screens: Match compartments; mounted to wall with Continuous panel brackets .
1. Thickness: 1 inch
2. Height: 48 inch
3. Depth: 24 inch

2.03 ACCESSORIES

A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Extruded aluminum, anti-grip profile.
1. Size: 1 inch by 1-1/2 inch, minimum.

C. Wall and Pilaster Brackets: Stainless steel; continuous type.

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. Hinges: Stainless steel; satin finish.
1. Continuous hinge, gravity-type self closing.

F. Door Hardware: Stainless steel; satin finish.
1. Door Latch: Slide type with exterior emergency access feature.
2. Door Strike and Keeper with Rubber Bumper: Continuous type, mount on pilaster in alignment with door latch.
3. Provide door pull each side for outswinging doors.

G. Coat Hook with Rubber Bumper: One per compartment, mounted on door.

H. Wall Stop: Provide wall mounted rubber bumper for outswinging doors that swing against walls.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and 1/2 inch and 1 inch 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.

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 10 21 13.19

SECTION 11 52 13
PROJECTION SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Projection Screens

B. Mounting hardware

C. Switches

1.02 RELATED REQUIREMENTS

A. Division 16: Electrical

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

B. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

1.04 ALTERNATIVES

A. See Section 01230 - Alternatives, for product alternatives affecting this section.

1.05 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Shall describe characteristic and specifications of manufactured item showing compliance to the Schedule.

C. Shop Drawings: Shall indicate layout and details of equipment showing sizes, construction, and detail pertinent to installation.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Comply with manufacturer's instructions for handling and storage of units.

B. Do not deliver equipment to project until dry and heated storage space is provided.

1.08 PROJECT CONDITIONS

A. Supplier shall be responsible for quantities shown on the drawings

B. Coordinate ____ installation with size, location and installation of service utilities.

C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.09 WARRANTY

A. See Section 01780 - 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. Draper, Inc: www.draperinc.com.

B. Da-Lite Screen Company, Inc. Warsaw IN

C. Bretford: www.bretford.com

D. Stewart Filmscreen Corporation: www.stewartfilmscreen.com

E. Substitutions: See Section 01600 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Viewing Surface and Masking Materials
   1. Mildew-Resistance Rating: Zero or 1 when tested in accordance with ASTM G21.
   2. Flame Resistance: Passes NFPA 701.
   3. Flame-Spread Index: Not greater than 75 when tested in accordance with ASTM E84.

2.03 MANUFACTURED ITEMS

A. Front Projection Screens: Factory assembled unless otherwise indicated.

B. Basis of Design - Da-Lite 92688 Model C with CSR
   1. Turf Room Type
      a. In [Turf Room under mezzanine overhang]: Manual, matte light diffusing fabric screen, horizontally tensioned , ceiling mounted.
      b. Size:
         1) 104"W x 58"H viewing area, Nominal diagonal 119 inches
      c. Viewing Surface:
         1) Matte White with 2 feet extra black drop.
      d. Screen Fabric:
         1) Screen Fabric to be flame retardant and mildew resistant fiberglass.
         2) Bottom of fabric shall form a pocket holding a 3/8 inch diameter metal rod
      e. Mounting:
         1) Mezzanine beam mounted (3 inches from wall)
      f. Roller: 3 inch steel spring roller with bearings for easy operation.
      g. Case:
         1) Case shall be 22 gauge embossed steel, with flat back to prevent scraping fabric.
         2) Case end caps not allowing exposed roller pins and shall form brackets for wall installation.
         3) Case and caps shall have a powder coat finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that projection screens are ready for installation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 INTERFACE WITH OTHER WORK

3.04 STARTING EQUIPMENT

A. Demonstrate proper operation of equipment to Owner's designated representative.

END OF SECTION 11 52 13

SECTION 11 66 23
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basketball backstop and accessories

B. Sports cage (batting cage)

C. Volleyball standards and sleeves

D. Wall padding

E. Pole Vault Recessed

F. Protective Netting

1.02 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete floor slab to receive floor sleeves and anchors.

B. Section 13 34 19 - Pre-Engineered Metal Building: Structural members supporting basketball systems and Batting cages

C. Section 09 65 67 - Rubber Athletic Flooring: Gymnasium and Track flooring

D. Division 26 - Electrical

1.03 ALTERNATES

A. See Section 01 23 00 - Alternates, for product alternates affecting this section.

1.04 REFERENCES

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2004.

B. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 2004.

C. NFPA 70 - National Electrical Code; 2002.

D. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2000.

E. NFPA 286 - Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Wall and Ceiling Interior Finish; 2000.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Electrical characteristics and connection locations.
   2. Fire rating certifications.
   3. Structural steel welder certifications.
   4. Manufacturer's installation instructions.

C. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gage of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations; additional support structure required for mounting.

D. Samples: Submit samples of wall pad coverings and equipment padding, in manufacturer's available range of colors.

E. Operating and maintenance data, for each operating equipment item.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

C. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.09 CLOSEOUT ACTIVITIES

A. See Section 01 79 00 Demonstration and Training.

B. At completion of work, provide qualified and trained personnel to demonstrate operation of each item of equipment and instruct Owner in operating procedures and maintenance.
   1. Test equipment prior to demonstration.
   2. Individual Performing Demonstration: Fully knowledgeable of all operating and service aspects of equipment.
   3. Obtain Owner's signature acknowledging demonstration of equipment.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for all equipment.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Gared Performance Sports Systems, Noblesville, Indiana.

B. Acceptable Manufacturers:
   1. Porter Equipment Company, Broadview Illinois.
   2. Jaypro Sports Inc., Waterford CT., www.jaypro.com
   3. Draper Inc., www.draperinc.com.
   4. Substitutions: See Section 01 6000 Product Requirements.

2.02 GYMNASIUM EQUIPMENT - GENERAL REQUIREMENTS

A. See drawings for sizes and locations.

B. Coordinate additional steel requirements for mounting with pre-engineered metal building manufacturer.

C. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of contract documents.

D. Hardware: Heavy duty steel hardware, as recommended by manufacturer.

E. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.03 BASKETBALL GOALS

A. General
   1. Basketball goals to be equipped with Backboards, Goals, Winches, and Accessories ready for use.
   2. All metal parts shall have one coat of black primer and shall be finish painted in field to match the building color scheme. All metal parts will be packaged adequately for protection during shipment from manufacturer.
   3. Backstop manufactured in accordance with 1194 Rule 1, Section 8, stating that all parts of the backboard support system shall be at least 6" behind backboard.

B. Ceiling Suspended Forward Fold Backstop, Front Braced
   1. Model No. 3107 Single Post ceiling suspended, forward fold, front braced backstop as manufactured by Gared Performance Sports Systems Inc., Noblesville, Indiana.
   2. Unit shall be supported from 3-1/2" O.D. x 0.120" wall ASTM A-500 Grade B horizontal and
   3. 2-3/8" O.D. x 12 gauge (0.109") wall ASTM A-513 vertical structural steel tubing secured to the building with heavy gauge steel stampings or weldments (as required by building conditions). When truss span widths exceed 10'-0", 3-1/2" O.D. x Schedule 40 (0.216") wall ASTM A-500 Grade B will be used for the horizontals. Spans over 14'-0" will use welded bridge pipe.
   4. The backstop shall be of a single post design with a main vertical mast made of 6-5/8" O.D. x 0.120" wall ASTM A-500 Grade B structural steel tubing with 2-1/2" x 1-1/2" x 14 gauge (0.083") wall ASTM A-513 rectangular steel tube sway braces miter cut and welded in place to a top horizontal 4" x 1-1/2" x 0.18" web ASTM A-36 steel channel. Main mast will be suspended from superstructure with an offset hanger 3" in front of the pivot point. Units with less than 3" offset will not be approved as equal. Backstop shall be manufactured to allow 6" vertical adjustment for plumbing of the backboard. All fittings shall be heavy gauge steel stampings or weldments. A direct goal attachment is used to transfer stress from the goal to the main mast assembly preventing strain on the backboard.
   5. Front brace shall be 1-7/8" O.D. x 12 gauge (0.109") wall ASTM A-513 steel tubing attached to the main mast 12" to 18" above the backboard. When truss heights are higher than 27'-0", front brace shall be 2-3/8" O.D. x 12 gauge (0.109") wall ASTM A-513 steel tubing. Folding brace shall be of a jackknife design with an adjustable hinge for easy installation and field adjustment. Backstop shall be raised and lowered with 1/4" galvanized aircraft cable with a breaking strength of 7000 lbs. Backstop manufactured in accordance with 1994 rule 1, section 8, stating that all parts of the backboard support system shall be at least 6" behind backboard.
      a. Goal shall be mounted directly through backboard into a heavy structural steel weldment which shall be clamped to the vertical 6-5/8'' O.D. center mast.

C. Wall Mounted Swing Up
   1. Model No. 2400 Adjustable swing up wall mounted structure
   2. Wall Attachment: Unit shall be attached to 2" x 7.25" clear coated wood pads supported by 4/0 . Unit will to be supported with 4/0 chain fastened to front of the unit and attached to a wood pad mounted on the wall. Critical fittings shall be malleable iron castings, heavy gauge steel stampings, or weldments.
   3. Backstop shall be raised and lowered with 1/4" galvanized aircraft cable.

2.04 RECTANGULAR GLASS BACKBOARDS

A. Model No. LXP4200 Steel Framed Rectangular Glass Backboard

B. Backboards shall be 42 inches high by 72 inches wide.

C. Backboard shall be manufactured from 1/2" tempered glass set in heavy steel framing and cushioned by shock absorbing vinyl. Official border and target area permanently fired into glass.

D. Goal mounting structure shall be a heavy welded formed steel assembly, and directly attached to lower horizontal frame member to minimize stress on glass.

E. Provide Model No. PMCE Bolt-On Cushion Edge. Color to be selected from manufacturers standard line

F. Basketball Goal
   1. Model No. 2000+ Breakaway Goal as manufactured by Gared Performance Sports Systems Inc., Noblesville, IN.
   2. Goal shall be fabricated from 5/8" diameter cold drawn alloy steel round formed to an 18" inside diameter ring. Inside of ring shall be positioned 6" from face of backboard by heavy, formed steel hinged-type housing with removable cover to conceal mounting bolts and shock absorption mechanism of goal and to protect against finger entrapment.
   3. Goal shall be finished in electrostatic powder coated official orange finish.
   4. Goal shall be furnished complete with heavy-duty white anti-whip nylon netting and mounting hardware.

2.05 ELECTRIC BASKETBALL BACKSTOP HEIGHT ADJUSTER

A. Model No. 1171 Electric Adjust-A-Goal by Gared Performance Sports Systems Inc., Noblesville, IN.

B. Electric height adjuster shall be manufactured of steel using an electrically operated linear actuator to raise and lower backboard from 8' to 10' off of finished floor. Linear actuator shall be powered by a 115 volt single-phase motor and contain built in limit switches to ensure positive stopping at 8' and 10' heights. Adjust-A-Goal features a direct goal attachment to transfers load of play directly through backboard to support structure.

C. Height adjuster shall utilize a flush mounted single keyed switch to both raise and lower backstop

2.06 ELECTRIC WINCH

A. Model No. 1194 Electric Backstop Winch by Gared Performance Sports Systems Inc., Noblesville, IN.

B. Electric winch shall be a definite purpose electric winch designed specifically for use of basketball backstop positioning. Winch shall be worm gear type designed to hold backstop at any position during operation. Winch will be driven by a 1 HP, 120-volt, 60 hertz, single-phase instant reversing electric motor with thermal overload protection and manufactured to NEMA specifications.

C. Winch shall have high-speed worm gearing to support both radial and thrust loads, and positive locking double reduction gear drive providing 200:1 reduction rate for strong cable hold under load. Sealed gear case for lifetime maintenance free operation.

D. Winch shall incorporate a 4-1/2" diameter grooved drum to assure long cable life and proper coiling, with a tension roller for correct cable tracking even in slack conditions. Drum shall be grooved for 1/4" 7 x 19 galvanized aircraft cable to facilitate smooth take-up and proper spooling of cable. Drum shall allow 25 feet of travel on one (1) layer and 40 feet on two (2) layers.

E. Winch shall utilize a flush mounted single keyed switch to both raise and lower backstop

F. Winch shall have five (5) year warranty against material defects and workmanship.

2.07 BACKSTOP AUTO LOCK SAFETY STRAP

A. Model No. 1100 Safstop safety strap by Gared Performance Sports Systems Inc, Noblesville, IN.

B. Provide one for each backstop.

C. Safety strap shall be inertia sensitive to automatically lock basketball backstop in position at any time due to any sudden surge of speed created by possible malfunction of hoisting apparatus, winch, cable, pulleys, support fittings, etc.

D. Safety strap shall incorporate a two (2) inch wide nylon belt rated at 6,000 lbs. breaking strength. Entire unit to be tested to withstand 1,500 lb. free fall load and rated at 1000 lbs. Strap shall extend a maximum of 35'-0" and shall be automatically retracted and stored on a reel equipped with a special negator type constant force spring. Operation and locking action of strap shall be set by inertial force for immediate and positive setting, or centrifugal force to instantly lock basketball backstop before unit can gain momentum. Unit shall incorporate a fully automatic reset requiring no poles, ropes, levers or buttons.

E. Safety strap shall be furnished with universal mounting bracket to fit 3-1/2" O.D. pipe mounted either parallel or at right angles to backboard. Belt shall be supplied with an auto-lock belt clamp for ease of securing directly to basketball backstop.

2.08 INDOOR BOTTOM LIFT MULTI-SPORT CAGE

A. Manufacturer: Draper Bottom Lift Practice Cage

B. Size: 70'-0" Length

C. Netting: Cage net to be 12'-0" high x 12'-0" wide x 70'-0" long. An additional 12" of net shall drape on the floor preventing balls from going under the cage. Net shall be constructed from #252 black knotted nylon with 3/4" square mesh and shall be capable of stopping a baseball, softball and golfball.

D. Lifting cables pass through 2" wide frame suspension nylon belts with links attached to netting that terminate at steel weights.

E. Provide two corner zippers for cage access

F. Supporting Frame: Frame of cage to to be constructed of 1 7/8 inch heavy wall tubing with cross spreaders located at 11'-0" on center for hoist cable attachments. Hoist cables shall be 1/8 inch diameter vandal proof galvanized cable (2,100 lb breaking strength each cable). Bottom end of each cable shall terminate in a sling arrangement for proper support of frame assembly.

G. Upper ends of hoist cable shall terminate into individual hoist drums positioned on a continuous 1 5/8 inch tube line shaft. Line shaft shall turn in support assemblies equipped with steel ball bearing wheel rollers. Support assemblies shall be positioned adjacent to each hoist drum.

Support assemblies shall be secured to structural steel by means of turnbuckles and support chains.

H. Motor: Line shaft shall be driven by a heavy duty 1 HP 120V double output shaft, C-faced, double reduction (100 to 1) gear motor furnished with integral 6 ft lb brake mechanism and overload protection. Gear reducer shall be filled with oil and equipped with high quality seals. Rotary counting limit switch shall be an integral par to the operator.

I. All metal parts shall be painted flat black.

J. Motors shall utilize a flush mounted single keyed switch to raise and lower the divider curtain.

2.09 VOLLEYBALL STANDARDS

A. General:
   1. Volleyball standards to be equipped with nets, antenna, padding, winches and accessories ready for use.

B. Standards are 3.5" O.D. high strength, lightweight extruded anodized aluminum. The upper telescoping adjustable tube shall be 2 7/8" lightweight high strength aluminum. Finish shall be gray anodized. Uprights shall be removable type designed for use with below sleeves of above floor tee-bases. Upright shall be provided with adjustable high impact rubber foot to protect finished floors and allow for additional precise net adjustment. The uprights will have spring loaded infinite net height adjustment between 6' to 8'-4" to meet all age group height settings for both men and women. Standards shall meet NCAA, NFSHSA and USVBA specifications. The net tensioner shall incorporate a heavy duty, self-locking ratchet mechanism with a compression clutch brake release. A high tensile nylon strap will be used with the winch to achieve required net tension.

C. Volleyball Floor Plates/Sleeves
   1. Model No. 6100 volleyball floor sleeves with Model 6433 cover plates as manufactured by Gared Sports, Noblesville, IN.
   2. Cover plate shall be 6 5/8" diameter by 9/16" thick chrome with attached hinged cover. Diameter of opening shall be five (5) inches. Hinge and four holes in ring (for screwing into floor) shall be completely concealed under cover when in closed position, allowing for a completely flat surface. Floor plate is to be connected to floor allowing it to move with expansion and contraction of floor.
   3. Sleeve shall be 3.5" I.D. steel measuring 12-11/16" long.

D. Standard Protective Pads
   1. Model No. 6010 volleyball standard protective pads by Gared Sports, Noblesville, IN. Provide model No. 6020 for center standards as required.
   2. Pads shall be 72'' high and fabricated from 1-1/4" thick polyurethane foam covered with 14 oz. vinyl coated nylon on the outside and jersey inner liner. Each pad shall be tailored to easily fold around upright and fastened by Velcro flaps, covering winch and net tensioning hardware. Front side of pad shall be furnished with an opening for attaching and tensioning bottom strap from net.
   3. Color as selected by Architect from manufacturers' standards

E. Volleyball Net
   1. Model No. 7602 Collegiate volleyball net by Gared Sports, Noblesville, IN.
   2. Net shall be 32' L x 39" H with #48 black nylon mesh measuring approximately 4" by 4'' square. The net shall have a 2" white double thickness binding on all 4 sides. The end sleeves shall feature a 1' diameter wood dowel.

F. Net Antenna
   1. Model No. 6412 antenna by Gared Sports, Noblesville, IN.

2. Antennae is secured firmly to the net by insertion in the full length pockets in then sidelines markers fully eliminating the possibility of the antennae dislodging from the net.

2.10 PROTECTIVE WALL PADDING

A. Model No. 4510 Column Wall Pads and 4110 by Gared Performance Sports Systems, Noblesville, IN.
   1. Panels are 2' wide by 8' high. Panels shall be constructed of 2" thick 6 lb. density bonded foam. Each panel shall be covered with 14 oz. polyester reinforced laminated vinyl and cemented to 7/16" OSB exterior grade wood panels with one-inch nailing margins at top and bottom for securing panels to wall.
   2. Color to be selected by Architect from manufacturer' standards.
   3. Cutouts in panels shall be made in field to fit job conditions.

B. Model No. 4310 Corner Wall Pads by Gared Performance Sports Systems, Noblesville, IN.
   1. Panels are 2' wide by 6' high. Panels shall be constructed of 2" thick 6 lb. density bonded foam. Each panel shall be covered with 14 oz. polyester reinforced laminated vinyl and cemented to 7/16" OSB exterior grade wood panels with one-inch nailing margins at top and bottom for securing panels to wall.
   2. Color to be selected by Architect from manufacturer' standards.
   3. Cutouts in panels shall be made in field to fit job conditions.

2.11 POLE VAULT RECESSED BOX

A. Manufacturer: Gill Athletics
   1. Recessed Aluminum Vault Box - 502 with recessed lid - 50201
      a. Other Acceptable Manufacturers
      b. Sports Field Specialties
      c. Sports Edge

B. Substitutions: See Section 01 6000 Product Requirements.

C. Vault box lid to have a resin plug to avoid dead spot in basketball playing surface and to ensure lid remains in place. Plug to fill entire vault box void

2.12 PROTECTIVE NET

A. Location: Multi-Purpose Athletic Room A106

B. Netting: Basis of Design: West Coast Netting; Product: Woven #252 Netting - 3/8 inch mesh open. Provide black vinyl around perimeter of netting.

C. Accessories:
   1. Galvanized Aircraft Cable
   2. Metal Eyehooks
   3. Metal Clips
   4. Description: Provide metal eyehooks, attached to adjacent structural framing members supporting galvanized aircraft cable. Provide protective netting with clips in corners for securement of the top and bottom. Floor mounted eyehooks to be provided adjacent to column wall padding. Net to be tight when in use and prevent baseball from hitting sectional garage door and glazing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior start of work.

B. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

C. Inspect areas and conditions before installation. Notify Architect in writing of unsatisfactory or detrimental conditions. Do not proceed until conditions have been corrected. Commencing installation constitutes acceptance of work site conditions.

D. Verify that electrical services are correctly located and of the proper characteristics.

3.02 PREPARATION

A. Make arrangements as necessary to provide scaffolding to perform work under this section. Damage to floors, walls, equipment, and the like shall be corrected at the expense of the contractor under this section.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.

C. Install equipment rigid, straight, plumb, and level

D. Secure all equipment with manufacturer's recommended anchoring devices.

E. Install wall padding securely, with edges tight to wall and without wrinkles.

F. Separate dissimilar metals to prevent electrolytic corrosion

3.04 DEMONSTRATION

A. Demonstrate proper operation of equipment to Owner's designated representative.

3.05 ADJUSTING

A. Verify proper placement of equipment.

B. Verify proper placement of equipment anchors and sleeves

C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration.

3.06 CLEANING

A. Remove masking or protective covering from finished surfaces.

B. Clean equipment in accordance with manufacturer's recommendations

C. Protect installed product until Substantial Completion.

END OF SECTION 11 66 23

SECTION 11 66 43
INTERIOR SCOREBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior Scoreboards

B. Scoreboard Controller

C. Misc. Accessories

1.02 RELATED SECTIONS

A. Section 01 60 00 - Product Requirements

B. Section 04 20 00 - Masonry Veneer

C. Division 26 - Electrical

1.03 SUMMARY

A. Provide the equipment specified and denoted on the Drawings and specifications, and all required mounting hardware per manufacturer's recommendations. Provide the power receptacles, boxes, conduit and control wiring as necessary for a complete operational system. Provide this all in the base bid contract.

1.04 REFERENCES

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2004.

B. NFPA 70 - National Electrical Code; 2002.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Electrical characteristics and connection locations.
   2. Fire rating certifications.
   3. Structural steel welder certifications.

C. Provide a colored rendering of scoreboard with color selections and graphics provided by Owner prior to manufacturing of scoreboard.

D. Operating and maintenance data, for each operating equipment item.

1.06 QUALITY ASSURANCE

A. Scoreboards shall be UL Listed and CSA certified.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

C. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.08 CLOSEOUT ACTIVITIES

A. See Section 01 7900 Demonstration and Training.

B. At completion of work, provide qualified and trained personnel to demonstrate operation of each item of equipment and instruct Owner in operating procedures and maintenance.
   1. Test equipment prior to demonstration.
   2. Individual Performing Demonstration: Fully knowledgeable of all operating and service aspects of equipment.
      a. Provide at least one hour of training wtih Owner.
   3. Obtain Owner's signature acknowledging demonstration of equipment.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for all equipment.

D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Fort Loramie Local School District Board of Education name and registered with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Electro-Mech

B. Nevco

C. Fair Play

D. Daktronics

2.02 GYMNASIUM SCOREBOARDS

A. Basis of Design: Electro-Mech LX2340.
   1. Other Approved Models
      a. Nevco - 2700
      b. Fair Play - BB-1500-4
      c. Daktronics - BB-2101

B. Overall Board Size: 8 foot wide x 4 foot tall x 6 inches thick

C. Weight: 90Lbs.

D. Digit Size:
   1. Clock: 12 inch tall
   2. Score: 12 inch tall
   3. Period: 9 inch tall
   4. Possesion: 3 inch tall
   5. Bonus: 3 inch tall letter b/B

E. Board Color: Choice of manufacturers' standard line of colors.
   1. Final color selection to be chosen by Owner and Architect.

F. Team Name: Provide Schools approved "NAME" on board in lieu of "Home"

G. Accent Striping: Color chosen by Owner and Architect from Manufacturers' standard colors.

H. Branding: (2) Vinyl graphics to be on the left and right side blank spaces at the top of the scoreboard. Graphic vector files to be provided by architect.

I. ID Panel: 2' x full width of scoreboard. Verbiage to be provided by architect.

J. Scoreboard(s) shall be controlled with wireless controller(s).

K. Console equal to Electromech MP series. 2.4 GHz spread spectrum radio control.

L. Provide required mounting hardware to install the board(s) where denoted on the Drawings and per manufacturer's instructions.

M. Electrical Requirements
   1. Scoreboard: 120V, 1 phase, duplex receptacle above scoreboard.
   2. Amps: 1.2
   3. Hertz: 60

N. Control Console: MP-Series scoreboard control console w/Scorelink wireless.
   1. Electric: 120 VAC. Console comes with 6' electric cord.
   2. Provide one console per scoreboard.
   3. Wireless transmitter shall be embedded into control Console.
   4. Wireless receiver shall be embedded into the face of the scoreboard.
   5. Each console should be able to operate one board separately, or any other boards being installed separately.
   6. Where more than one board is installed in the gymnasium, each control console shall be able to operate one board at a time or all boards at the same time from the same controller.
   7. One (1) additional control console shall be furnished to the Owner which is capable of operating all boards. This will be considered a back-up console in the event that one is not working.

PART 3 INSTALLATION

3.01 EXAMINATION

A. Verify existing conditions prior start of work.

B. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

C. Inspect areas and conditions before installation. Notify Architect in writing of unsatisfactory or detrimental conditions. Do not proceed until conditions have been corrected. Commencing installation constitutes acceptance of work site conditions.

D. Verify that electrical services are correctly located and of the proper characteristics.

3.02 PREPARATION

A. Make arrangements as necessary to provide scaffolding to perform work under this section. Damage to floors, walls, equipment, and the like shall be corrected at the expense of the contractor under this section.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.

C. Install equipment rigid, straight, plumb, and level

D. Secure all equipment with manufacturer's recommended anchoring devices.

3.04 DEMONSTRATION

A. Demonstrate proper operation of equipment to Owner's designated representative.

B. Provide 2 hours of training for District's personnel on the operation, programming and maintenance of the system.

3.05 CLEANING

A. Remove masking or protective covering from finished surfaces.

B. Clean equipment in accordance with manufacturer's recommendations

C. Protect installed product until Substantial Completion.

END OF SECTION 11 66 43

SECTION 12 24 00
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

B. Motor controls.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

B. Section 26 27 26 - WIRING DEVICES: Finish requirements for wall controls specified in this section.

1.03 REFERENCE STANDARDS

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 affected installers.

C. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

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.

F. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

G. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum 5 years of documented experience with shading systems of similar size and type.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: One year.
   2. Fabric: One year.
   3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com.
   2. Hunter Douglas Architectural; RB500 Manual Roller Shades: www.hunterdouglasarchitectural.com.
   3. MechoShade Systems LLC; Mecho/5 System: www.mechoshade.com.
   4. SWFcontract, a division of Springs Window Fashions, LLC.; _____: www.swfcontract.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Interior Roller Shades - Basis of Design: Draper, Inc; Clutch Operated FlexShade: www.draperinc.com.
   1. Description: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete installation.
      a. Drop Position: Regular roll.
      b. Mounting: Window jamb mounted - inside, between jambs.
      c. Fabric: As indicated on drawings.
   2. Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
      a. Hardware Type: Universal brackets.
   3. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.

a. Material: Extruded aluminum or steel, with wall thickness and material selected by manufacturer.
b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
c. Roller tubes to be capable of being removed and reinstalled without affecting roller shade limit adjustments.

4. Hembars: Designed to maintain bottom of shade straight and flat, selected from manufacturer's standard options.
   a. Style: Closed pocket; aluminum elliptical slat inside pocket with heat-sealed ends.
5. Manual Operation:
   a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
   b. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 pounds minimum breaking strength. Provide upper and lower limit stops.
   c. Chain Retainer:
      1) Manufacturer's standard clip.
6. Accessories:
   a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to mounting end caps, without exposed fasteners; clear anodized finish.
   b. End Cap Covers: Match fascia or headbox finish.
   c. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.03 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
   2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

C. 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. 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. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 SYSTEM STARTUP

A. Motorized Shade System: Provide services of a manufacturer's authorized representative to perform system startup.

3.05 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.07 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

3.08 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION 12 24 00

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for manufactured casework.

B. Wall mounted countertop support brackets.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry

B. Section 12 35 50.13 - Educational Casework

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2016.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

C. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

G. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

I. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

C. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

D. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than Five years of documented experience.

B. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
   5. Replace, repair, or rework all work for which certification is refused.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Manufacturers:
         1) Formica Corporation: www.formica.com.
         2) Panolam Industries International, Inc; Nevamar Standard HPL: www.panolam.com.
         3) Wilsonart: www.wilsonart.com.
         4) Substitutions: See Section 01 60 00 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. NSF approved for food contact.
      d. Laminate Core Color: Same as decorative surface.
      e. Finish: Matte or suede, gloss rating of 5 to 20.
      f. Surface Color and Pattern: As indicated on A9.0 Material Finish Schedule.
   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. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Avonite Surfaces: www.avonitesurfaces.com.
         2) Dupont: www.corian.com.
         3) Formica Corporation: www.formica.com.
         4) Meganite, Inc: www.meganite.com.
         5) Wilsonart: www.wilsonart.com.
         6) Formica.
      b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
      c. Color and Pattern: As indicated on Sheet A9.0 Material Finish Schedule
   3. Other Components Thickness: 1/2 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.
7. Fabricate in accordance with manufacturer's standard requirements.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, color to be coordinated in field.

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.

2.04 ACCESSORIES

A. Support Brackets: Surface mounted, L-shaped, style as indicated on drawings.
1. Size: As recommended by manufacturer to support counter depth.
2. Load capacity: 350 pounds minimum per bracket.
3. Finish: Painted black.

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. 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 12 36 00

SECTION 12 35 50.13
EDUCATIONAL CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Casework manufactured with plastic laminate facing.

1.02 RELATED SECTIONS

A. Section 07 92 00 - Joints Sealants

B. Division 22 - Plumbing

C. Division 26 - Electrical

D. Division 27 - Communications

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on all hardware.

C. Shop Drawings shall be submitted soon after the award of contract. Drawings shall consist of floor plans indicating arrangement and relationship to adjacent work and equipment, complete elevations of casework. Centerline of services requirement shall be noted.

D. Submit three (3) complete color samples of every component for Architect selection. Selection shall be from manufacturer standards.

1.04 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 Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience.

C. Design Requirements for Educational Casework
   1. Design system of cabinets which will be chip and abrasion-resistant under normal usage and will protect student clothing, materials, musical instruments and cases from damage under normal use.
   2. Design shelving to withstand continuous use without surface or front edge breakdown.
   3. Hanger rods or hooks to support a minimum vertical load of 200 pounds applied anywhere.
   4. Full-height door to support a minimum vertical load of 200 pounds applied at outer edge.

1.05 PRE-INSTALLATION MEETING

A. Convene two weeks before starting work of this section.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Do not deliver casework to project until dry and heated storage space is provided.

1.07 PROJECT CONDITIONS

A. Casework supplier shall be responsible for quantities shown on the drawings.

B. Casework supplier shall be responsible for making field measurements to insure proper fit of casework items.

C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

D. For delivery and installation of casework and equipment, building conditions shall be as follows:

1. Building is secure and weather tight, with windows and doors installed, heat and air conditioning systems functional. Walls and openings are plumb, straight and square.
2. Concrete floors must be level within acceptable trade tolerances. Floor must be within 1/8 inch of level per 10 foot run, non-accumulative, when tested with a straight edge in any one direction.
3. Wood or metal blocking (wall grounds) must be installed within partitions prior to delivery of casework and furnishings to allow for immediate installation on delivery.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Stevens Cabinets Co, Model 1200 Series (3MM Edge, Full Overlay).
   1. The catalog numbers of the manufacturer listed are intended to include a complete and total item as the catalog number is specified in the current catalog. The item shall be provided complete with hardware, accessories, features and components.

B. Other Acceptable Manufacturers:
   1. TMI Systems Design Corporation, Dickinson North Dakota: Model Series Educational.
   2. Case Systems, Normal Wood Products, Midland, Michigan; Model Series Education.
   3. Hoge Lumber Company, New Knoxville, Ohio; Model Series Educational.
   4. Substitution Procedures: See Section 01 60 00 - Product Requirements.
      a. Submit samples of each proposed substitution to the offices of Garmann/Miller & Associates for evaluation. Samples shall be retrieve by submitter upon evaluation by Architect.
      b. Sample size to be nominally 2'-0" by 3'-0" with a drawers, doors, shelves and accessories showing compliance with this specification.

2.02 MATERIALS

A. Wood Base Components
   1. Wood fabricated from old growth timber is not permitted.
   2. Wood fabricated from timber recovered from riverbeds or otherwise abandoned is permitted, unless otherwise noted, provided it is clean and free of contamination; identify source; provide lumber re-graded by an inspection service accredited by the American Lumber Standard Committee, Inc.
   3. Particleboard, medium density fiberboard, plywood, wheatboard, strawboard, and panel substrates shall contain no added urea-formaldehyde resins

B. Plastic laminates, provide one of the following
   1. Reference standard laminate selections in the Finish Material Schedule.

C. Edge Banding for Plastic Laminate:
   1. Edge banding to match laminate selection of cabinet. Reference Finish Material Schedule for selections.

D. Melamine Faced Particleboard:
   1. Medium density particleboard complying with ANSI A208.1, Grade M-2, with decorative surface of thermally fused melamine impregnated web complying with ALA 1992.

E. Particleboard: ANSI A 208.1, Grade M-2

F. Hardboard: AHA A135.4, Class 1 tempered
   1. AHA A135.4, Class 1 tempered

2.03 HARDWARE

A. Hinges: Heavy duty five knuckle style, with overlaying leaves capable of 270 degree swing. Hinges shall be constructed of 0.90 inch minimum thickness steel, hospital tipped with non-removable pin.
   1. Color: as selected from manufacturer's standard.
   2. Doors less than 47 inches in height shall have two (2) hinges and doors 47 inches in height and greater shall have three (3) hinges
   3. Hinges shall have vertical adjustment and shall be mounted with two (2) 5 mm thread screws, each leaf with additional #8 screws: two (2) in cabinet leaf and three (3) in door leaf. Total nine (9) fasteners per hinge.

B. Door Catches:
   1. Catches shall be a heavy duty spring loaded, large diameter (17.5 mm) roller type catch. Doors less than 48 inches in height shall one (1) catch mounted at the bottom and doors 48 inches in height and greater shall be provided with catches both top and bottom of door.
   2. Catch strike plate shall be injection molded ABS, with integrally molded engagement ring. Strike shall have a wide face bumper insuring a positive door stop.

C. Pulls: Solid metal, 5 inches in length.
   1. Style: A minimum of (5) different styles as offered by Cabinet manufacturers' standard. Stevens - Essentials Collection - Bar128, Curved bar
   2. Color: As selected from manufacturer's standard. - Satin Nickel Finish

D. Drawer Slides
   1. Drawers shall be suspended with bottom mount, side and bottom attached nylon roller epoxy coated steel slides to ensure quiet, smooth operation. Lateral stability is achieved through a special formed captive profile. Slides shall have 100 pound load rating, with both in and out drawer stop, 3 inch self close feature and side adjustment cam allowing 3 mm side to side alignment.
      a. Drawers noted for file use or full extension shall have 150 pound load rating, with both in and out drawer stop, 3 inch self close feature and side adjustment cam allowing 3 mm side to side alignment.
      b. Drawers noted for file use shall include extruded to mounted molded side rails to accept standard hanging file folders with a 200 pound rating.

E. Hangard Bars: Shall be heavy chrome plated oval tubing mounted in adjustable end wall sockets.

F. Shelf Supports: Adjustable shelf supports shall be injection molded clear polycarbonate. Supports shall incorporate integral molded lock tabs to retain shelf from tipping or inadvertent lift out. Supports shall have 5 mm diameter double pin engagement into precision bored cabinet vertical hole patterns. Adjustment shall be 1-1/4 inches (32mm) spacing. Supports shall have a compression ridge effecting force against shelf edge to maintain positive pin engagement. Supports shall have molded-in screw attachment feature. Static test load shall exceed 200 pound per clip. Shelf spans above 27 inches shall have 5-point support with backs drilled to receive a mid-span shelf support, further reducing deflection. Shelf spans 27 inches or less shall have end 4-point support.

G. Casters and Mounting Frame: Heavy duty non-maring swivel casters shall have ball bearing swivels, four (4) bolt mounting and tread braking. Mobile cabinets shall have 5 inch diameter casters, rated for 300 pounds each. Two (2) casters to be swivel braking and two (2) to be non-swivel, non-braking. Casters shall be integral bolted onto steel channel cabinet member. Fourteen (14) gauge formed channel member shall be 3 3/4 inch wide with 3/4 inch downturn legs each with double thick hem edge. Steel frame member shall have bolt attachment to bottom and cross bolted into barrel style fastening system.

H. Locks:
   1. Provide either of the lock systems listed below:
      a. High security 6-tumbler lock system shall be provided where noted by model number or indicated on drawings. Locks shall have diecast body with dead bolt engagement tang. Locks shall have removable and interchangeable 6-tumbler core for easily field and customer re-keying options.
      b. Locks shall be cylinder type, die-cast, with five (5) disc tumbler mechanism. Each lock shall be provided with a key.
   2. Keying:
      a. Each room shall be keyed alike with each room keyed differently.
      b. Locks shall be master keyed using the casework manufacturers master keying system. (This is independent of any other master keying system)
      c. Provide lock where indicated.
      d. Provide locks on all wardrobe units and tall storage units.

I. Chain Stop:
   1. Manufacturers standard, install on all doors that will hit casework components or adjacent walls

J. Cabinet Boxes - cut outs:
   1. All cabinet box cut outs must be completed in the field unless otherwise noted on the cabinet shop drawing submittals.
   2. Special attention to field measuring, cutting or drilling shall be made when making any cabinet cut outs.
   3. Cut outs shall be made as tight to the size of the cabinet penetration as possible.
   4. Cut outs for low voltage wiring shall be trimmed accordingly with specified mounting bracket.
      a. Manufacturer:
         1) Erico, Caddy Mounting Bracket, (MPL series) or equal
         2) Mounting brackets placed inside the cabinet box shall match the same size, location and configuration as the box placed inside the wall that the cabinet butts up against.
         3) Mounting Bracket furnished and installed by Low Voltage Contractor.
         4) Install mounting brackets in cabinet using proper length wood screws.
   5. Cut outs for electrical wiring shall be made so that outlet box extension is mounted flush to back panel of casework. Casework installer shall field measure and cut holes in casework to accommodate outlet installation.
   6. Excessively overcutting any cabinet cut outs is not permitted, unless specifically approved by Garmann/ Miller & Associates.
   7. Plumbing penetrations and cut outs shall have proper finish trim around pipes to properly cover any cut outs. Trims to be supplied and installed by Plumbing Contractor.

2.04 COMPONENTS

A. Cabinet Boxes - Base and Wall:
   1. Core:
      a. Base Cabinets:
         1) Front and Sides: 3/4 inch particleboard
         2) Base - Bottom - Toe Kick: 3/4 inch plywood
         3) Back: Entrapped 3/8 inch particle or 1/4 inch tempered hardboard
      b. Wall Cabinets:
         1) Top and Bottom: 3/4 inch particleboard
         2) Sides: 3/4 inch particleboard

3) Back: Entrapped 3/8 inch particle or 1/4 inch tempered hardboard

2. Surface:
   a. Exposed Vertical Surfaces: GP28
   b. Semi-exposed parts (interior of open cabinets, not including drawer body): CL20 or melamine
   c. Concealed Surfaces: CL20 or melamine
   d. Panel ends: GP28
3. Edge: Finish all exposed edges (including wall cabinet top and bottom) with 1 mm PVC
4. Construction/Joinery: Doweled, glued under pressure

B. Cabinet Doors
1. Core: 3/4 inch particleboard
2. Surface: GP28 with CL20 liner on back
3. Edge: 3 mm PVC
4. Hardware: Heavy duty, 5 (five) knuckle, 2-3/4 inch institutional type hinge (no concealed hinges)
5. Construction/Joinery: Doweled, glued under pressure

C. Drawer Fronts:
1. Core: 3/4 inch particleboard
2. Surface: GP28 with CL20 liner on back
3. Edge: 3 mm PVC
4. Construction/Joinery: Doweled, glued under pressure
5. Hardware: Wire design pulls

D. Drawer Sides and Backs:
1. Core: 1/2 inch particleboard of 5/8 inch medium density fiberboard
2. Surface: Melamine on all visible surfaces with drawer in normal open position.
3. Hardware: Combination epoxy coated steel and nylon roller bearing drawer slides, self closing. Full extension for file drawers.

E. Drawer Bottoms:
1. Core:
   a. Fully captured construction: Minimum thickness 1/4 inch.
   b. Platform construction: Minimum thickness 1/2 inch.
2. Surface: Melamine panel product or particle board.
3. Hardware: Platform construction must use wrap around drawer slide.

F. Interior Cabinet Shelves:
1. Core: 1 inch particle board
2. Top and Bottom Surface: Thermofused Laminate
   a. Color: Match the interior color; Pearl unless noted othwerwise.
3. Edge: 1 mm PVC on front and back edges
4. Construction/Joinery: Multiple holes (minimum 5 mm diameter at 1-1/4 inches on center.
5. Hardware: Adjustable shelf supports

2.05 FABRICATION

A. Cabinets parts shall be accurately machined and precision bored for premium grade quality joinery construction. Cabinets shall be assembled under controlled case clamp conditions assuring final cabinet squareness and proper joint compression.

B. Cabinet corners shall be joined with dowel pin construction with 8 mm industrial grade hardwood laterally fluted dowels with chamfered edges..

C. Cabinet ends shall be dowel pinned into horizontal members. Ends shall be one piece continuous from top to floor for added load carrying capacity.

D. Tops and bottoms shall be joined to cabinets ends using dowels and glue. Top of base cabinet shall be full depth.

E. Frame rails shall be joined to ends with dowels and glue.

F. Two (2) toe kick panels shall be insert from cabinet from and back edges, and doweled into cabinet with the same fluted dowel pin and glue joint construction as base and wall cabinets

G. Wall cabinet top and bottoms shall feature the same fluted dowel pin and glue construction.

H. Mounting rails shall be fully concealed behind backs. Rails shall be 3/4 inch thick and fastened to cabinet ends the dowel and glue construction. Wall cabinets and tall cabinets shall incorporate two (2) rails. Wall cabinets shall have rails positioned at top and bottom. Tall cabinets shall have rails positioned at top and intermediate location. Base cabinet units shall have rail positioned in the upper back area.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that job site and the conditions under which the work of this section is to be performed. Notify the Architect of any unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable.

3.02 INSTALLATION

A. Be sure that any concete floor finish is complete before installing any cabinets or other materials that may affect the finish of the specified flooring.

B. Install in accordance with manufacturer's instructions.

C. Casework, countertops and related materials to be conditioned to average prevailing humidity condition in installation areas prior to start of work.

D. Casework shall be installed plumb, level, true, straight with no distortions. Securely attach to building structure with anchorage devices of appropriate type size and quantity to meet codes and safety conditions.

E. Where laminated clad casework and countertops abuts other finished work scribe and trim to accurate fit.

F. Cut openings in countertops for sinks and other items required. Cut to size from template furnished by supplier for sinks or use designated sink on job.

G. Countertops shall be installed flush against wall. Provide clear sealant at top and around ends of countertops, endsplashes and backsplashes where they meet wall.

H. Adjust casework and hardware so that doors and drawers operate smoothly without or bind.

I. Install a chain stop on doors where door will hit an obstruction casework components or adjacent walls before it is full opened install on all doors that will hit

3.03 CLEANING

A. Clean exposed surfaces, edges, and cabinet interiors. Clean construction and installation marks.

B. Protect installed casework from subsequent construction operations.

END OF SECTION 12 35 50.13

SECTION 13 34 19
PRE-ENGINEERED BUILDINGS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes a rigid-frame type pre-engineered metal building of the nominal length, width, eave height, and roof pitch indicated. Mechanical equipment, Electrical equipment and piping loads and framing shall be included in the engineering load criteria.
   1. Exterior walls are covered with factory-finished wall panels attached to framing members.
   2. Interior metal liner system is required for roof and exterior walls.
   3. Roof system consists of the manufacturer's standard standing-seam painted roof, over insulation. Provide all roof penetration seals.
   4. Manufacturer's standard building structural components and accessories may be used, provided components, accessories, and complete structure conform to design indicated and specified requirements, including concrete masonry on the elevation.
   5. The intent of this specification section is to provide the manufacturer's standard metal panels that meet or exceed the specifications. In the event a manufacturer's standard panel specification does not comply, the manufacturer is to supply the closest comparable panel products in all aspects.

1.02 SECTION INCLUDES

A. Structural steel frame.

B. Complete roof covering system consisting of the exterior roof panels, panel attachments, sealants, mastics, trim and flashings as required.

C. Complete wall covering system consisting of the exterior wall panels, panel attachments, sealants, mastics, trim and flashings as required for a weathertight assembly.

D. Thermal Insulation

E. Foamed-insulation-core concealed fastener metal roof panels, with related metal trim and accessories.

F. Wall accessories, including:
   1. Louvers
   2. Wall openings trim

G. Roof Accessories, including:
   1. Gutters
   2. Pipe flashing
   3. Snow guard
   4. Downspout shoe
   5. Ventilators

1.03 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Foundations and anchor bolts.

B. Section 08 11 13 - Hollow Metal Doors and Frames

C. Section 08 36 13 - Sectional Doors

D. Section 09 90 00 - Paints and Coatings: Finish painting of structural members, doors, roof curbs, etc.

1.04 REFERENCES

1.05 DESIGN REQUIREMENTS

A. Design structural systems according to professionally recognized methods, standards, and building codes.

B. Design under supervision of professional engineer licensed in Ohio.

C. Design Loads:
   1. Refer to drawings for design loads
   2. Applicable Building Code: Ohio Basic Building Code.

D. Design wall and roof panel system to withstand specified loads with deflection of 240 of span at metal panel, maximum.

E. Anchor Bolts: Furnish design criteria for anchor bolts, to resist the loads induced by the design loads on the structure.

1.06 SUBMITTALS FOR REVIEW

A. Product Data: For each type of metal building system component. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
   1. Structural-steel-framing system. Contact Architect and Structural engineer to discuss main structural bay spacing design before issuing submittal.
   2. Metal roof panels.
   3. Metal wall panels.
   4. Metal liner panels.
   5. Insulation and vapor retarder facing
   6. Flashing and trim.
   7. Accessories.

B. Shop Drawings: For the following metal building system components. Include plans, elevations, sections, details, and attachments to other work.
   1. Anchor-Bolt Plans: Submit anchor-bolt plans and templates before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.
   2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
   3. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory-and field-assembled work; show locations of exposed fasteners.
   4. Accessory Drawings: Include details of the following items, at a scale of not less than 11/2 inches per 12 inches:
      a. Flashing and trim.
      b. Gutters.
      c. Downspouts.
      d. Louvers.
      e. Roof Curbs.

C. Samples for Verification: For each type of exposed finish required, prepared Samples of sizes indicated below:
   1. Metal Panels: Nominal 12 inches (300 mm) long by actual panel width. Include fasteners, closures, and other exposed panel accessories.

2. Flashing and Trim: Nominal 12 inches (300 mm) long. Include fasteners and other exposed accessories.
3. Vapor-Retarder Facings: Nominal 6-inch-(150-mm-) square Samples.
4. Accessories: Nominal 12-inch-(300-mm-) long Samples for each type of accessory.

D. Delegated-Design Submittal: For metal building systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, Registered in the State of Ohio, responsible for their preparation.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified erector, manufacturer, and professional engineer.

B. Welding certificates.

C. Metal Building System Certificates: For each type of metal building system, from manufacturer.
1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
   a. Name and location of Project.
   b. Order number.
   c. Name of manufacturer.
   d. Name of Contractor.
   e. Building dimensions including width, length, height, and roof slope.
   f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
   g. Governing building code and year of edition.
   h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
   i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
   j. Torque requirements for bolted connections.
   k. Building-Use Category: Indicate category of building use and its effect on load importance factors.
   l. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.
   m. Design calculations.

D. Erector Certificates: For each product, from manufacturer, and signed by manufacturer certifying that the erector complies with requirements.

E. Manufacturer Certificates: For each product, from manufacturer, and signed by manufacturer certifying that products comply with requirements.

F. Material Test Reports: For each of the following products:
1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.
5. Nonshrink grout.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for insulation and vapor-retarder facings. Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.

H. Source quality-control reports.

I. Field quality-control reports.

J. Surveys: Show final elevations and locations of major members. Indicate discrepancies between actual installation and the Contract Documents. Have surveyor who performed surveys certify their accuracy.

K. Warranties: Sample of special warranties.

1.08 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

B. Metal Roofing Installation under Section 07 61 00 - Sheet Metal Roofing.
   1. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

1.09 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer and member of MBMA.
   1. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.
   2. Engineering responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this project and who is acceptable to manufacturer.
   1. Minimum of 5 years experience in this or similar trade
   2. Five similar installation references in past 3 years

C. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single manufacturer.

D. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code -Steel."
   2. AWS D1.3, "Structural Welding Code -Sheet Steel."

E. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.
   1. Domestic Steel Certificate: Certify compliance with Section 153.011 of the Ohio Revised Code.

F. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

G. Fire-Resistance Ratings: Where indicated, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
   2. Combustion Characteristics: ASTM E136.

H. Pre-installation Conference: Conduct conference at Project Site. Contractor, Owner, and Architect of Record shall attend this conference.
   1. Review methods and procedures related to metal building systems including, but not limited to, the following:
      a. Condition of foundations and other preparatory work performed by other trades.
      b. Structural load limitations.

c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
d. Required tests, inspections, and certifications.
e. Unfavorable weather and forecasted weather conditions.

2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
   a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
   b. Structural limitations of purlins and rafters during and after roofing.
   c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
   d. Temporary protection requirements for metal roof panel assembly during and after installation.
   e. Roof observation and repair after metal roof panel installation.
3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
   a. a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
   b. Structural limitations of girts and columns during and after wall panel installation.
   c. c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
   d. d. Temporary protection requirements for metal wall panel assembly during and after installation.
   e. Wall observation and repair after metal wall panel installation.

1.10 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements:
   1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
   2. Established Dimensions for Metal Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.11 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Section 03 3000 - Cast-in-Place Concrete.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations, which are specified elsewhere.

C. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leak-proof, secure, and noncorrosive installation.

D. Coordinate ALL required loads and bracing for building equipment, including but not limited to: monorail hoists, bridge cranes, and mechanical equipment.

1.12 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents

C. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period due to any cause.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Completion.

D. Special Weather tightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain watertight, including leaks, or otherwise fail to remain weather tight within specified warranty period, due to material or installation failure within the specified warranty period with a NO dollar limit.
   1. Warranty Period: 20 years from date of Completion.

1.13 ATTIC STOCK

A. Maintenance Stock: Pack, protect, and label all excess material and store on site as directed by the Design professional.
   1. Provide 2% excess Nuts, Bolts, Screws, Washers and other required fasteners for each metal building.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
   1. American Steel Building Co., Inc.
   2. Butler Manufacturing Co
   3. Chief Buildings
   4. Kirby Building Systems
   5. Nucor Building Systems
   6. VarcoPruden Buildings

B. Substitutions: See Section 01 6000 Product Requirements

2.02 METAL BUILDING SYSTEMS

A. Description: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
   1. Provide metal building system of size and with bay spacing, roof slopes, and spans as indicated in the construction document. Contact Architect and Structural engineer to coordinate main structural bay spacing design.

B. Primary-Frame Type:

1. Rigid Frame: Solid-member, structural-framing system with or without interior columns as shown on the architectural design.

C. End-Wall Framing: Manufacturer's standard wind shear end walls. Future additions, consisting of load-bearing end-wall and corner columns and rafters not required.

D. Secondary-Frame Type: Manufacturer's standard purlins and joists and exterior framed bypass girts.

E. Clear Height under Structure: As noted on drawings.

F. Roof Slope: As shown on Drawings.

G. Roof System: Reference specification 01 23 00 Alternates
   1. Base Bid - Manufacturer's concealed fastener 4" insulated metal roof panel equal to Metl-Span "CFR" panel, with kynar 500 painted finish.
   2. Alternate - Manufacturer's concealed fastener standing seam metal roof with 2" min rib height and pencil rib striations equal to Chief Building MVP panel on top of 4" R-seal system.

H. Exterior Wall System: Reference specification 01 23 00 Alternates
   1. Base Bid - Manufacturer's concealed fastener formed metal panel equal to Metl-Span "C-620" panel, with kynar 500 painted finish. 2 layer fiberglass batt insulation with fabric equal to Silvercote "ES R25 and R10 Double layer wall system"
   2. Alternate - Manufacturer's exposed fastener formed metal panel equal to Metl-Span "BR5-36" panel, with kynar 500 painted finish. 2 layer fiberglass batt insulation with fabric equal to Silvercote "ES R25 and R10 Double layer wall system"

2.03 METAL BUILDING SYSTEM PERFORMANCE

A. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
   1. Design Loads: As indicated on Drawings.
   2. Design Loads: As required by Ohio Building Code.
   3. Live Loads: Include vertical loads induced by the building occupancy indicated on Drawings. Include loads induced by maintenance workers, materials, and equipment for roof live loads.
      a. Building Occupancy: As indicated on Drawings.
   4. Roof Snow Loads: Include vertical loads induced by the weight of snow, as determined by Ohio Building Code. Allow for unbalanced and drift loads.
   5. Wind Loads: Include horizontal loads induced by a basic wind speed as required by Ohio Building Code
   6. Collateral Loads: Collateral loads include additional dead loads over and above the weight of the metal building system such as liner system, rigid roof insulation, lighting, sprinkler systems and roof-mounted mechanical systems, make-up air units, canopies. Include not less than **5 LBF/SQ.FT** loading for collateral loading.
      a. Structural Framing and Roof and Siding Panels: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturers Associations (MBMA) "Design Practices Manual" and the Ohio Building Code. Provide framing to support make-up air units, exhaust fans. Confirm loads with contractors for that work. Design connections to the pre-engineered structure for the masonry exterior walls. For smaller mechanical equipment items, respective mechanical trades Contractor to provide steel supports and connectors, but metal building supplier must provide connection details of hangers to the structure.

b. Contractors shall confirm weight and dimensions with manufacturer and coordinate final locations.

7. Auxiliary Loads: Include dynamic live loads, such as those generated by moving gymnasium equipment indicated on Drawings.
8. Load Combinations: Design metal building systems to withstand the most critical effects of load factors and load combinations as required by the Ohio Building Code
9. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:
   a. Primary framing members: L/180 for roof snow load.
   b. Purlins and Rafters: Vertical deflection of L/180 (under Live Load, Snow Load, or Wind Load) and L/120 under Dead Load plus Live Load.
   c. Girts: Horizontal deflection of L/120 at metal panel
   d. Metal Roof Panels: Vertical deflection L/180 of the span.
   e. Metal Wall Panels: Horizontal deflection of L/180 of the span at metal panel and L/480 at brick veneer.
   f. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
10. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:
    a. Lateral Drift: Maximum of 1/300 of the building height.
11. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.

B. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to Ohio Building Code.

C. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of roof area when tested according to ASTM E 1680 at negative test-pressure difference of 1.57 lbf/sq. ft. (75 Pa).

E. Air Infiltration for Metal Wall Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested according to ASTM E 283 at static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

F. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at test-pressure difference of 2.86 lbf/sq. ft. (137 Pa).

G. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward acting, wind load design pressure of not less than 6.24lbf/sqft (330 Pa) and not more than 12lbf/sq.ft (575 Pa).

H. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.

I. Thermal Performance: Provide insulated metal panel assemblies with the following maximum U-factors and minimum R-values for opaque elements when tested according to ASTM C 1363 or ASTM C 518:
   1. Metal Roof Insulation:

a. R-Value: 36 or greater.

2. Metal Wall Insulation:
   a. R-Value: 24 or greater. Insulation must be a two layer system with thermal breaks and must fill entire girt cavity

2.04 FRAMING COMPONENTS

A. Primary Framing: Rigid Frame (RF Series) solid web framing consisting of tapered or uniform depth rafters rigidly connected to tapered or uniform depth columns. Provide a clear span that supports the loads at bay spacings indicated.

B. Endwall Framing : Corner posts, end posts and rake beams.

C. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prime painted with coil coating, to comply with the following:

1. Purlins: C-or Z-shaped sections; fabricated from steel sheet material or structural-steel shapes; 3-inch wide flanges.
   a. Depth: 8 inch depth or as indicated on the drawings.
   b. Shall be 100 percent prime painted before shipping to job site.
   c. Purlin bracing tab. Provide purlin bracing tab so that flange brace does not penetrate through the vapor barrier of the metal building insulation facing. Refer to drawings for more details.
2. Girts: C-or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch wide flanges.
   a. Depth: Minimum depth as indicated on the drawings. Greater depth as needed to comply with system performance requirements.
   b. Shall be 100 percent prime painted before shipping to job site.
3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
4. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch-diameter, cold-formed structural tubing to stiffen primary-frame flanges.
5. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
6. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
7. Girt bracing tab. Provide girt bracing tab so that flange brace does not penetrate through the vapor barrier of the metal building insulation facing. Refer to drawings for more details.
8. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; designed to withstand required loads.
10. Gymnasium Equipment Bracing: **All gymnasium equipment requiring additional supports to be provided in the pre-engineered metal building package. Coordinate locations and sizes with equipment manufacturer. Locations of gymnasium equipment as shown on the drawings. Items include but are not limited to basketball goals and batting cages.**

D. Bracing: Provide adjustable wind bracing as follows:

1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50; or ASTM A 529/A 529M, Grade 50; minimum 1/2-inch diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
2. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
3. Fixed-Base Columns: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
4. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.
5. Bracing: Provide wind bracing using any method specified above, at manufacturer's option.

E. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide hot-dip galvanized bolts for structural-framing components that are galvanized.

F. Materials:
1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55 (205 through 380), or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70 (310 through 480); or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80 (170 through 550), or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70 (310 through 480).
7. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 (230 through 550), or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80 (340 through 550); with G60 (Z180) coating designation; mill phosphatized.
8. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
    a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 (230 through 550) or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80 (340 through 550); with G90 (Z275) coating designation.
9. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts; ASTM A 563 (ASTM A 563M) carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
    a. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.
10. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
    a. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.
11. **Primary, Secondary and all other structural steel items shall have the following painted primer. Primer: SSPC-Paint 15, Type I, Gray oxide.**

G. Wind Bracing: Portal, torsional, diagonal bracing or diaphragm in accordance with manufacturer's standard design practices; utilizing rods, angles, and other members, with minimum yield strengths as required for design.

H. Primary Frame Flange Bracing: Attached from purlins or girts to the primary framing, minimum yield strength as required for design.

I. Base Angles: 2 inch x 3 inch x 0.059 inch steel angles, with minimum yield strength of 55,000 psi, anchored to the floor slab or grade beam with power driven fasteners or equivalent at a maximum spacing of 3 feet on center and not more than 6 inches from the end of any angle member.

J. Sag Angles and Bridging: Steel angles, with minimum yield strength of 36,000 psi.

K. Fabrication: Fabricate according to manufacturer's standard practice.
   1. Fabricate structural members made of welded plate sections by jointing the flanges and webs by continuous automatic submerged arc welding process.
   2. Welding operators and processes: Qualified in accordance with AWS D1.1.
   3. Field Connections: Prepare members for bolted field connections by making punched, drilled, or reamed holes in the shop.

L. Component Identification: Mark all fabricated parts, either individually or by lot or group, using an identification marking corresponding to the marking shown on the shop drawings, using a method that remains visible after shop painting.

M. Shop Coating: Finish all structural steel members using one coat of manufacturer's standard shop coat, after cleaning of oil, dirt, loose scale and foreign matter.

N. Package building components for shipping by common carrier.

2.05 METAL ROOF PANELS - ALTERNATE

A. Roof Panels: Panel Rib; 2 inch high minimum, Standing-Seam Metal Roof Panels Formed with intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
   1. Material: Aluminum-zinc alloy-coated steel sheet, 0.0276-inch (24GA) nominal thickness.
      a. Exterior Finish: 2 - Coat Fluoropolymer, Kynar 500 or Hylar 5000
      b. Color: As selected by Architect from manufacturer's full range of standard colors
   2. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from aluminum-zinc alloy-coated steel sheet.
   3. Joint Type: Mechanically seamed, folded according to manufacturer's standard.
   4. Panel Coverage: 36 inches
   5. Panel Height: 2 - 3 inches
      a. Uplift Rating: UL 90.
   6. Panel Configuration: Equal to: Chief Buildings, MVP panel

B. Finishes:
   1. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions, except as modified below
   2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.06 INSULATED METAL ROOF PANELS - BASE BID

A. **Concealed Fastener, Standing Seam, Foamed-Insulation-Core Metal Roof Panels**: Structural metal panels consisting of an exterior standing seam with an interior tongue and groove joint, coupled with a vapor seal in the standing seam, and provides superior resistance to air and moisture intrusion. Attached with concealed fasteners to the structure.
   1. Basis of Design: Metl-Span**, CFR Insulated Metal Panel**.
   2. **G-90 Galvanized Coated Steel:** ASTM A 653 **or Aluminum-Zinc Alloy-Coated Steel**: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A 755/A 755M.
   3. **Aluminum-Zinc Alloy-Coated Steel Sheet**: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ55 (Grade 340, Coating Class AZM165) unpainted Galvalume Plus coating.
   4. Exterior Face Sheet: 24 gauge coated thickness, with stucco embossed surface.
      a. Finish: Fluoropolymer two-coat system
      b. Color: As selected by Architect from manufacturer's standard colors
   5. Interior Face Sheet: 24 gauge coated thickness, with stucco embossed surface Mesa profile.
      a. Finish: Polyester two-coat system
      b. Color: As selected by Architect from manufacturer's standard colors
   6. Endlaps: Provide panels with factory endlaps, notching, swedging and backer plates; where panel lengths permit.
   7. Low Eave Treatment: Provide cutback for trim/gutter installation; where panel lengths permit.
   8. Panel Width: [30 inches (762 mm)] [36 inches (914 mm)] [42 inches (1067 mm)] [as shown on drawings].
   9. Panel Thickness: 4 inch (102 mm) or as required to meet performance requirements min R value as shown on drawings.
   10. Insulating Core: Polyurethane with zero ozone depletion potential blowing agent
      a. Closed Cell Content: 90% or more as determined by ASTM D 6226
      b. Compressive Strength: As required to meet structural performance requirements and with a minimum of 22 psi as determined by ASTM D 1621
      c. Shear Strength: As required to meet structural performance requirements and with a minimum of 36 psi as determined by ASTM C 273
      d. Tensile Strength: As required to meet structural performance requirements and with a minimum of 41 psi ASTM D 1623
      e. Minimum Density: 2.0 pcf (32 kg/m3) as determined by ASTM D 1622
      f. **Thermal Resistance (R-Value)**: **[**insert corresponding value deg. F * hr * sq. ft./Btu (K * sq. m/W)**]** as determined by ASTM C 518 at 75 degrees Fahrenheit mean temperature.

2.07 METAL WALL PANELS

A. **Base Bid - Tapered-Rib-Profile, Concealed-Fastener Metal Wall Panels:** Formed double reveal profile with evenly-spaced raised plat pan between reveals; designed to be installed by lapping side edges of adjacent panels
   1. Material: Zinc-coated galvanized steel sheet, 22 GA, 50,000 psi (min.).
      a. Exterior Finish: 2 coat, Fluoropolymer, Kynar 500 / Hylar 5000.
      b. Color: As selected by the Architect from manufacturer's full range.
         1) Wall panel color to be selected by Architect from full range of colors.
   2. Major-Rib Spacing: 5.5 inches o.c.

3. Panel Coverage: 16 inches.
4. Panel Height: 0.875 inches.
5. Panel configuration: Equal to Metl Span "CS-620" on exterior of building.

B. **Alternate - Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels:** Formed vertical profile with evenly-spaced raised plat pan between reveals; designed to be installed by lapping side edges of adjacent panels
1. Material: Zinc-coated galvanized steel sheet, 24 GA, 50,000 psi (min.).
a. Exterior Finish: 2 coat, Fluoropolymer, Kynar 500 / Hylar 5000.
b. Color: As selected by the Architect from manufacturer's full range.
1) Wall panel color to be selectedby Architect from full range of colors.
2. Major-Rib Spacing: 7.2 inches o.c.
3. Panel Coverage: 36 inches.
4. Panel Height: 1.5 inches.
5. Panel configuration: Equal to Metl Span "BR5-36" on exterior of building.

C. **Tapered-Rib-Profile, Metal Interior Liner Panels:** Formed with raised, trapezoidal major ribs and flat pan between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
1. Material: Zinc-coated (galvanized) steel sheet, 24 GA, 50,000 psi (min.).
a. Panel Finish: White Pigmented Polyester
1) Perforated - Exterior Walls with Silvercote White Fabric backing - Open area percent to be selcted by architect from manufacturer's full range.
(a) All perforated liner panels to have white insulation fabric between panel and fiberglass batt.
2) Solid - Interior walls where indicated on drawings
b. Color: As selected by Architect from manufacturer's full range.
2. Major-Rib Spacing: 12 inches o.c.
3. Panel Coverage: 36 inches.
4. Panel Height: 1.25 inches.
5. Panel Configuration: Equal to Metal Sales "PBR Panel"

D. Finishes:
1. Exposed Coil-Coated Finish: Roof & Metal Walls
a. Two (2) -Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Liner Panels & Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.08 THERMAL INSULATION

A. Formaldehyde-free fiberglass batt or fiberglass blanket complying with ASTM C 991, type 1 and ASTM E 84 indicated below; consisting of fibers manufactured from glass or rock wool.
1. Reflective Faced: Type III (blankets with reflective membrane covering), Category 1 (membrane is a vapor retarder), Class A (membrane-faced surface with a flame-spread index of 25 or less).
2. **Wall Vapor Barrier Facing:** Silvercote ES
a. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested according to ASTM E 96/E 96M, Desiccant Method.

b. Composition: Aluminum foil facing, elastomeric barrier coating, fiberglass scrim reinforcement, and kraft-paper backing.
c. Composition: White polypropylene film facing, woven HPDE scrim reinforcement, and metallized-polyester film backing.

3. **WALL INSULATION**
   a. Facing: Composite of fiberglass and facing having flame spread index of 25 or less and smoke developed index of 50 or less, when tested in accordance with ASTM E 84.
   b. Facing: Silvercote ES Double Layer Wall System
   c. Insulation thickness: R25 + R10 or meet performance requirements of .047 U-factor
      1) Fiberglass insulation must fill entire girt cavity
   d. Insulation blankets to be installed continuous from bottom sill to top of wall.

4. **ROOF INSULATION - ALTERNATE**
   a. Polyurethane Foam-Plastic Board Insulation: Manufacturer's standard proprietary composite rigid plyurethane-core board with integral factory-applied exterior and interior fiber reinforced plypropylene scrim facings, with factory-applied tape tabe system for an integral vapor-retarding air barrier membrane; fabricated with Shiplap edges.
      1) Basis-of-Design Product; Subject to compliance requirements, provide Pacific Insulation Products; R-Seal Board Insulation or comparabe product
      2) Thickness: 4" R-Seal panel
      3) Composite product to have maxiumum flame-spread and smoke-developed indexes of 200 and 150, respectively, when tested in accordance with ASTM E84; and "Passing" in Full-Scale fire test when tested in accordance with UL 1715
      4) Composite Product to have maxium air leakage of 0.04 Cubic Ft. Per Minuter per sq. ft. under a pressure differential of 0.3 inch wg (75 Pa) when tested in accordance with ASTM E2357 (Assembly Test)
      5) Board insulation to be left exposed to interior of the building without an additional thermal barrier
      6) Interior Finish to be White Embossed texture finish

2.09 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
   1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2.10 ROOF ACCESSORIES

A. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fascia, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
   1. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Provide corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.

2. Joint Sealers: Provide Tape Mastic Sealants and Concealed Joint Sealants per Section 07 92 00, "Joint Sealants".
3. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
4. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
5. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
6. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
7. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-(25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction. Provide metal trim cover for closure strips.

B. Flashing and Trim: Formed from 0.022-inch (0.56-mm) nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.
1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, internal and external corners, fasciae, and fillers.
2. Opening Trim: Formed from 0.022-inch (0.56-mm) nominal-thickness, aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.

C. Gutters: Formed from 0.022-inch (0.56-mm) nominal-thickness, aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate to 40"-0" long sections with a minimum 96-inch-(2438-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
1. Gutter Supports: Fabricated from same material and finish as gutters: spaced 36 inches (900mm) o.c.
2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
3. Expansion Joints: Provide gutter expansion joint a maximum spacing of 40'-0". Fabricate joints with a neoprene (0.15 thick) membrane bonded to 0.048 aluminum flanges anchored to gutter sections with pop rivets set in heavy bead of sealant. Joint to be concealed with a cover plate matching the profile of gutter.

D. Downspouts: Formed from 0.022-inch (0.56-mm) nominal-thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutters: spaced 5 feet o.c.

E. Eave Gutters: Roll-formed 26 gage steel sheet, with gutter straps, fasteners and joint sealant; manufacturer's standard color.
1. Downspouts: 4 x 5 inches in 10 foot lengths, with downspout elbows and downspout straps; same color as wall panels.

F. Pipe flashing: Provide EPDM rubber flashings for vent penetrations.

G. Snow Guards:
1. Snow Guards: Prefabricated, noncorrosive units designed to be installed without penetrating roof panel, with predrilled holes and clamps or hooks for anchoring. Snow Guards to be located as noted in the drawings. Allow for free movement of roof panels

and snow guard rails as recommended by manufacturer. Snow Guard shall be approved for use with project roof type, roof panel width, project snow load and roof pitch by snow guard manufacturer.

2. Metal Rail Type Guard: Consisting of aluminum or stainless-steel rods or bars held in place by supports clamped to vertical ribs of standing-seam roof. System compatible with metal building manufacturers standing seam profile and height. Provide all accessories necessary including intermediate snow clips for complete system as recommended by system manufacturer.
3. S-5! ColorGard Snow Guards by Metal Roof Innovations, Ltd. Colorado Spring, CO 80908 with SnoClip: www.s-5.com
4. Acceptable Manufacturers:
   a. Metal Roof Innovations, Ltd. Colorado Springs, CO
   b. Berger Building Products, Feasterville, Pennsylvania
   c. Colorbar; www.snobar.com
   d. Sno-Gem Inc
   e. Zaleski Snow Guards
5. Furnish and install where indicated on plans assembly for snow retention as follows: S-5! clamps are to be spaced at every panel seam. Clamps should be on or as near as possible to the hold down clip location without interfering with the ability of the roof to float. All clamps are to be installed true-to-line. Stainless steel fasteners are to be tightened using a tool with a rating of 115 inch-pounds. This tension shall be periodically verified during installation. In no event shall the clamp spacing exceed 24 inches.
6. The snow guard is to be furnished and installed on each S-5-U clamp with 3/8" x 3/4" stainless steel bolt and washer furnished by manufacturer. The snow guard shall be pre punched on 4" centers. Adjacent sections of snow guard are to be joined using a splice plate provided by manufacturer.
7. SnoClip: Aluminum component with integrated rubber foot to retard the migration of snow and ice beneath the cross member. Rubber foot to prevent abrasion to the roof panel finish.
8. The color strip, which is 2" wide x 8' long, that is inserted into the snow guard system shall be furnished with the system. Color shall match the roof panels.

H. Downspout Shoe (Boots): Cast iron
   1. Rectangular downspout to round discharge outlet designed to empty straight into a soil pipe. Shoe is designed with an 90 degree discharge.
   2. Length: 24 inches (nominal)
   3. Size: Top bell to match downspout
   4. Manufacturer:
      a. Peidmon Pipe Denver NC: B1 Series
      b. Neenah Foundry Company: www.neenahfoundry.com R4929 Series
      c. Barry Pattern and Foundry Company, Inc. Birmingham, Al: B25C Series
      d. McKinley Iron Works Inc., Fort Worth, Texas; DS2 Series
      e. Substitutions: See Section 01 6000 - Products Requirements

2.11 SOURCE QUALITY CONTROL

A. Testing Agency: The Owner or the Architect of Record will employee/engage a qualified testing agency to evaluate/test product.

B. Testing: Test and inspect shop connections for metal buildings according to the following:
   1. Bolted Connections: Shop-bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

2. Welded Connections: In addition to visual inspection, shop-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
    a. Liquid Penetrant Inspection: ASTM E 165.
    b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    c. Ultrasonic Inspection: ASTM E 164.
    d. Radiographic Inspection: ASTM E 94.

C. Product will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

2.12 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.
1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances and with AISC “Specification for Design, Fabrication, Erection of Structural Steel for Buildings”.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing.
5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
1. Make shop connections by welding or by using non-high-strength bolts.
2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.13 FINISHES

A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

B. Exterior Face Sheet Coil-Coated Finish System
   1. Silicone-Polyester Two-Coat System: 0.20 – 0.25 mil primer with 0.7 – 0.8 mil color coat, [meeting solar reflectance index requirements].
      a. Basis of Design: Metl-Span, Silicone Polyester.
   2. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, [meeting solar reflectance index requirements].
      a. Basis of Design: Metl-Span, Fluoropolymer.

C. Interior Face Sheet Coil-Coated Finish System:
   1. Polyester Two-Coat System: 0.20 – 0.25 mil primer with 0.7 – 0.8 mil color coat
   2. Basis of Design: Metl-Span, Igloo White
   3. Silicone-Polyester Two-Coat System: 0.20 – 0.25 mil primer with 0.7 – 0.8 mil color coat
      a. Basis of Design: Metl-Span, Silicone Polyester
   4. Fluoropolymer Two-Coat System: 0.2-mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat
      a. Basis of Design: Metl-Span, Fluoropolymer
   5. Vinyl Plastisol Two-Coat System: 0.2 mil primer with 4 mil high solids plastisol finished with PVC technology.
      a. Basis of Design: Metl-Span, Vinyl
   6. 304 and 316 Stainless Steel: 2B 304 or 2B 316 Stainless Steel.
      a. Basis of Design: Metl-Span, Stainless Steel

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

B. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

C. Before erection proceeds, survey elevations and locations of concrete-and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
   1. Engage professional Surveyor Engineer to perform surveying.

D. Proceed with erection only after unsatisfactory conditions have been corrected.

3.02 GENERAL

A. Install in accordance with manufacturer's instructions.

3.03 PREPARATION

A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.04 ERECTION OF STRUCTURAL FRAMING

A. Erect framing in accordance with AISC 360 - Specification for Structural Steel Buildings.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

F. Erect metal building system according to manufacturer's written erection instructions and erection drawings.

G. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

H. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

I. Base and Bearing Plates: Clean concrete-and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

J. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

K. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
   1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for bolt type and joint type specified.
      a. Building manufacturer to provide torque requirements for high strength bolt connections.
      b. Contractor to coordinate with Owner's employed third party testing agency confirming bolted connections are installed per metal building manufacturer's recommendations.

L. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
   1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
   2. Locate and space wall girts to suit openings such as doors and windows.
   3. Locate canopy framing as indicated.
   4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

M. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
   1. Tighten rod and cable bracing to avoid sag.
   2. Locate interior end-bay bracing only where indicated.

N. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

O. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303-10.

3.05 ERECTION - WALL AND ROOF PANELS

A. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

B. Fasten cladding system to structural supports, aligned level and plumb.

C. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

D. Provide expansion joints where indicated.

E. Use concealed fasteners.

F. Install sealant and gaskets to prevent weather penetration.

G. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
   1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.

H. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
      a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
   2. Install metal panels perpendicular to structural supports unless otherwise indicated.
   3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
   4. Locate and space fastenings in uniform vertical and horizontal alignment.
   5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
      a. Lap metal flashing over metal panels to allow moisture to run over and off the material.

I. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.

J. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
   1. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

K. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
   1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
   2. Prepare joints and apply sealants to comply with construction document requirements."

3.06 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations. It is the intent of the Architect to to have full length panels from eave to ridge. If contractor is not able to install one continuous panel from eave to ridge, this must be brought to the attention of the Architect before bidding.
   1. Install ridge caps as metal roof panel work proceeds.
   2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
   1. Install clips to supports with self-drilling or self-tapping fasteners.
   2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
   3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
   4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
   5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels for fasteners.
   6. Provide metal closures at peaks, rake edges, rake walls, and each side of ridge caps.

C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated on the drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.07 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Provide an exterior grade clearance to underside of exterior wall enclosure panels of a minimum of 8" above finished grade. Finished grade at exterior walls shall be an aggregate mow strip of a minimum 12". Provide a vermin wall of 16" in height above finished grade of either reinforced poured concrete stem wall or reinforced and grouted CMU (concrete masonry units). Vermin wall shall be a minimum of 8" thick.
   2. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
   3. Shim or otherwise plumb substrates receiving metal wall panels.
   4. When two rows of metal panels are required, lap panels 4 inches minimum.

5. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
6. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
7. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
8. Install screw fasteners in predrilled holes.
9. Install flashing and trim as metal wall panel work proceeds.
10. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
11. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
12. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), nonaccumulative, on level, plumb, and on location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.08 ERECTION - GUTTERS AND DOWNSPOUTS

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

B. Apply bituminous paint on surfaces in contact with cementitious materials.

C. Connect downspouts to storm sewer system.

3.09 THERMAL INSULATION INSTALLATION

A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
1. Install pre-engineered building insulation system in accordance with manufacturer's installation instructions and the approved shop drawings.
2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
3. Install in exterior spaces without gaps or voids. Do not compress insulation.
4. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
5. Fit insulation tight in spaces and tight to exterior side of the sealed liner fabric and around mechanical and electrical services within plane of insulation.
6. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.

B. Straps: Banding shall be attached to the bottom side of the purlins and run two directional.
1. Cut straps to length and install in the pattern and spacings indicated on shop drawings.
2. Tension straps to required value.

C. Vapor Barrier Fabric:
1. Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
2. Position pre-folded fabric on the strap platform along one eave purlin.
3. Clamp the two bottom corners at the eave and also centered on the bay
4. Pull the other end of the pleat-folded fabric across the building width on the strap platform, pausing only at the ridge to fasten the straps and fabric in position where plane of the roof changes and to release temporary fasteners on the opposite ridge purlins.

5. Vapor barrier shall be stretched taught to eliminate all wrinkles and sagging in the barrier system.
6. Once positioned, install fasteners from the bottom side at each strap/purlins intersection.
7. Trim edges and seal along the rafters.
8. All seams must be completely sealed and stapled seams are not acceptable.

D. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.
1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
2. Sound-Absorption Insulation: Where sound-absorption requirement is indicated for metal liner panels, cover insulation with polyethylene film and provide inserts of wire mesh to form acoustical spacer grid.

3.10 INSTALLATION - ACCESSORIES

A. Install door frames, doors, overhead doors, and windows and glass in accordance with manufacturer's instructions.

B. Seal wall and roof accessories watertight and weather tight with sealant in accordance with Section 07 90 05.

C. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

E. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

F. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
   1. Provide elbows at base of downspouts to direct water away from building.
   2. Tie downspouts to underground drainage system indicated.

G. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.11 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner or the Architect of Record will employee/engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:
   1. High-Strength, Field-Bolted Connections: Connections shall be tested and inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
   2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

C. Product will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.13 CLEANING AND PROTECTION

A. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
   1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
   2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

B. Touchup Painting: Cleaning and touchup painting are as specified in the Construction Document.

C. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
   1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 13 34 19

SECTION 21 05 01
FIRE PROTECTION MATERIALS/METHODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping specialties

B. Installation requirements common to piping systems and equipment specification sections

C. Concrete Housekeeping Pads.

D. Emergency repairs or operation

E. Provisions for later installations

F. Final completion

G. Project Conditions

H. Quality Assurance

I. Warranty

J. Supervision and cooperation

K. Coordination drawings

L. Maintenance and operating manuals

M. Record drawings

1.02 RELATED REQUIREMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1 and 2, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to section 01 6000 - Product Requirements

C. Commissioning
   1. Section 01 9113 - General Commissioning Requirements
   2. Section 01 9114 - Commissioning Authority Responsibility

D. Refer to Division 26, Electrical Specifications, and to the requirements stated therein applicable to the Mechanical Work, where coordination of trades is covered.

E. The Drawings prepared for this Project are an outline to show where pipes, and apparatus must go in order to harmonize with the building and installations of the various trades. Work must be installed in accordance with the Drawings insofar as possible. Drawings shall be carefully checked during the course of bidding and construction. If discrepancies, errors, or omissions are discovered prior to or during the construction phase, notify the Engineer immediately for interpretation or correction. Take necessary measurements and be responsible for same, including clearances for equipment that is to be furnished. The Architect/Engineer shall reserve the right to make minor location changes of piping and equipment where such adjustments are deemed desirable from an appearance or operational standpoint. Such changes will be anticipated sufficiently in advance to avoid extra work or unduly delay progress on the Project.

F. The general building drawings shall be used to obtain dimensions and exact locations and as a check with other Contractors to avoid interferences with their Work. Refer to applicable Drawings on branches of the Work where other trades are involved on the Project so that added field work and job delays resulting from conflicts between crafts can be avoided. Piping

that is prefabricated before coordinating with the other trades may have to be redone at no additional cost if conflicts are encountered.

1.03 SUMMARY

A. The Contractor(s) shall provide the labor, materials, equipment, appliances, services and transportation, and perform the operations in connection with the construction and installation of the Work. Work shall be as herein specified and as denoted on the accompanying Drawings.

B. The Contractor(s) shall arrange and pay for permits and inspections required in connection with the Work. The Contractor shall apply for and pay for meters, regulators, recorders, and gauges required. The Contractor must present to the Owner through the Architect/Engineer, properly signed certificates of final inspection by the governing authorities when they become due and shall not cover up Work until approved by those authorities.
   1. The owner will pay for the approval as required by the Ohio Basic Building Code. The Sprinkler contractor shall submit hydraulic calculations and drawings to the architect/engineer for state approval. Three sets required for state approval. The contractor shall secure and pay for all other building permits and governmental fees, licenses and inspections.

C. Materials or labor obviously required to fully complete the Work shall be included, even though each item necessarily involved is not specifically mentioned or shown. Such Work and materials shall be furnished and shall be of the same grade or quality as the parts actually specified and shown. Should there be a conflict between the plans and Specifications, the greater quantity and better quality shall be furnished.

D. Should an overlap of Work between the various trades become evident, the Engineer shall be notified. Such an event shall not relieve the Contractor of the responsibility for the Work called for under his branch of the Specifications until a written clarification or directive is issued concerning the matter.

E. Related Work Specified Elsewhere
   1. Firestopping is Work of this Section though fire barrier sealants (firestopping) for walls and floors are specified in Section 07 8400. Contractors are responsible for proper sizing of their sleeves and core-drilled holes so that they are at least 1-1/2 inches larger in diameter than the penetrating items. Schedule 40 steel sleeves and core-drilled holes made excessively large or made and not used, will be firestopped and charged to the Contractor who was responsible.

F. Related Work by Others
   1. All electrical wiring, and fire alarm wiring to be done under Division 26, Electrical.

G. Cutting of water lines, electric conduit, or similar service lines in the course of Work performed under this Section shall be immediately repaired as part of the Work of this Section.

1.04 REFERENCE STANDARDS

A. Standards are described by reference to various associations. These are in addition, but not limited to, to those listed in:
   1. AGA American Gas Association
   2. ANSI American National Standards Institute
   3. ASHRAE American Society of Heating, Refrigeration, and
   4. Air Conditioning Engineers
   5. ASME American Society of Mechanical Engineers
   6. AWS American Welding Society
   7. AWWA American Water Works Association
   8. CISPI Cast Iron Soil Pipe Institute

9. NFPA National Fire Protection Association
10. OSHA Occupational Safety and Health Act
11. SMACNA Sheet Metal and Air Conditioning Contractors National Association
12. UL Underwriters' Laboratories, Inc.

B. Work shall be in complete accordance with codes, rules, and ordinances, regulations of authorities, bodies, associations, and governments, having proper or legal jurisdiction. Specifically, the following requirements shall be met in their entirety.
1. State and Local Rules, Regulations, Codes, Statutes, and Ordinances
2. NFPA 70 - National Electrical Code; National Fire Protection Association; 1999 appicable requirements.
3. National Board of Fire Underwriters
4. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 1993 (and Revision 1,2,3).
5. Other Codes and Standards as specifically noted in each Section of the Specifications.
6. Americans with Disabilities Act (ADA)

C. References made to codes and standards, in these Specifications or on the Drawings, shall be taken to mean the latest edition, amendment, or revision of such reference in effect as of the date indicated on the Bid Documents unless otherwise noted.

1.05 SUBMITTALS

A. Submit capacity requirements, hydraulic calculations, catalog cuts, and illustrations in accordance with requirements of specifications and as required by specific Sections of this Specification.

B. Provide required LEED submittals and documentation per Section 01 3000.

C. Shop Drawings shall be prepared by the Contractor or supplier.
1. Where limited space is available due to the nature of the Work, the requirements for shop and working drawings will apply, and the Contractor is required to prepare complete shop drawings showing the exact disposition of apparatus, equipment, piping, ductwork, and the like, and its relation to the building so there will be no irregularities or interferences. Shop drawings shall be prepared in coordination with other Contractors and other trades.
2. Electronic drawing files can be obtained from Garmann/Miller & Associates Inc.

D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Instruments used by the Contractor shall be accurately calibrated and maintained in good working condition.

B. Products and test instruments used shall be subject to approval of Architect/Engineer.

C. Products and test instruments used shall be provided by each respective Contractor.

D. Note that systems involved under this Contract heading shall be in accordance with applicable requirements listed in NFPA Standards.

E. Materials used in this Contract shall be those specified herein unless proposals for the use of alternate materials have been submitted and accepted in writing, as provided hereinbefore. Materials shall be strictly first grade of their kind and shall be new and in first-class condition when installed. Damaged materials will be rejected and must be replaced by proper and acceptable materials. Materials shall be similar and in accordance with the provisions of this Specification.

F. No materials or equipment may be installed under this contract heading which do not meet the approval of the authorities having jurisdiction. Specific materials may have certain restrictions or exclusions as to their usage, including where they may not be located. Such regulations shall be adhered to where applicable. The requirements and regulations of the local and state building codes and regulations currently adopted shall be adhered to.

G. Piping systems shall be installed by workmen having skills acquired by working at the trade which is recognized as necessary for competency.

H. Pressure piping systems installed shall conform to the requirements of the State piping and welding codes where applicable.

1.07 PROJECT CONDITIONS

A. Unless otherwise stipulated under a particular heading, the following rules relative to responsibilities of the several Contractors and subcontractors will apply.
   1. Each Contractor shall install roughing-in work pertaining to his trade for connection of Work performed under other Sections of these Specifications.

B. Certain areas will be designated for the storage of materials and equipment and cooperation with the Owner in minimizing interference with existing operations will be mandatory.
   1. Where possible, store materials inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.
   2. Follow manufacturer's instructions for receiving, inspecting, handling, storage, and protection of products prior to final installation

C. Equipment Clearances and Requirements
   1. For many items of equipment described in these Specifications, several manufacturers are listed. The manufacturer listed on the drawings is the make on which the layout was based and on which clearances, service required electrical, and plumbing characteristics, etc., have been checked. Additional manufacturers listed are considered acceptable.
   2. Due to the possibility of restrictions imposed by space limitations, the responsibility for resolving conflicts resulting from the use of equipment other than first named shall rest with the equipment supplier and the Contractor. Submittals for this equipment will be considered as a statement that clearances for access, service, maintenance, etc., have been checked and found adequate.
   3. Alternate equipment or the equipment of additional manufacturers named in these documents shall meet Base Bid Specifications. In the event such equipment or any equipment which the bidder proposes to furnish, deviates from the requirements of equipment first named regarding electric service, power wiring, control wiring, plumbing or piping, sound attenuation, or vibration damping, it shall be the responsibility of the bidder to include in his price a sufficient sum to cover additional costs or charges resulting therefrom.

D. In general, the piping shown on the Drawings shall be considered as diagrammatic for clearness in indicating the general run and connections required, and may not be shown in its true position. The piping and equipment may have to be offset, lowered or raised, as required, or as directed at the site in order to accommodate field conditions.

E. The fire protection contractor shall not install any piping, ductwork, equipment supported from the structure, conduit, etc. in the mechanical or electrical rooms until all walls and roof structure has been painted.

1.08 SUPERVISION AND COOPERATION

A. Work done by the Contractor under this Division shall include the services of an experienced superintendent, who shall be constantly in charge of the work, together with the qualified journeymen, helpers, and laborers required to properly unload, install, connect, adjust, start,

and operate, and test the Work involved, including related equipment and materials furnished under other contracts or by the Owner.

B. A Pre-Installation meeting shall convene one week before starting work of this section.

1.09 WARRANTY

A. See Section 01 7000 - Closeout Procedures, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ESCUTCHEONS AND PLATES

A. Provide approved plates around each pipe passing through walls, floors, partitions, and ceilings when piping is exposed to view and on exterior of building. Plates shall be chrome-plated metal and sized to cover exposed ends of pipe insulation and pipe sleeves.

B. Floor plates shall be split-type, heavy chrome-plated and securely attached to the pipe.

2.02 PIPE SLEEVES

A. Steel pipe sleeves shall be fabricated from Schedule 40 galvanized steel pipe.

B. Sleeves for copper piping shall be of compatible material to prevent interaction of piping materials.

PART 3 EXECUTION

3.01 INSTALLATION

A. Cutting and Patching
   1. Cutting and drilling of walls, slabs, and structural members, required in conjunction with Work under this Section, shall be done under the supervision of the Architect/Engineer. Work shall be neatly done, removing no unnecessary material. Holes, openings, etc., shall be located where they will not weaken the structure. No beams, joists, etc., shall be cut without the written consent of the Architect/Engineer.
   2. Cutting of holes in masonry and concrete shall be performed with a core drill to minimize spalling, and limit damage to wall. Locations shall be accurately determined and checked, and the appropriate drill bit shall be used to minimize hole size.
   3. Sleeves or thimbles for holes as well as escutcheons and trim plates shall be provided. Installation shall permit free movement of pipe.
   4. Patching of work, where necessary, is to be done by a mechanic of the appropriate trade. Unless otherwise noted, patching for Work performed under this Section shall be immediately repaired as part of the Work of this Section.

B. Pipe Sleeves: Install pipe sleeves where piping passes through walls, floors, ceilings, and roofs.
   1. Do not install sleeves through structural members of work, except as detailed on Drawings, or as reviewed and approved by Architect/Engineer.
   2. Install sleeves accurately centered on pipe runs.
   3. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run.
   4. Where insulation includes vapor barrier jacket, provide sleeve with sufficient clearance for installation.
   5. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves.
   6. Extend floor sleeves 1/4 inch above level floor finish, and 3/4 inch above floor finish sloped to drain unless otherwise noted.

7. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.
8. Where insulated piping passes through fire barriers, stop insulation at barrier for fire barrier penetration seal.
9. Where piping passes through nonfire rated, or nonwaterproof, partitions, floors, and walls, apply pipe insulation continuous through pipe sleeves.
10. Do not install sleeves through suspended ceilings.
11. Caulk nonfire rated sleeves with sealant.

C. Protection
1. Provide proper protection to the building during the execution of Work involved under this contract heading.
2. This protection shall include covering apparatus, building surfaces, and other materials to protect same from dirt; adequate temporary connections to protect apparatus from damage and required shielding to protect finished parts of the building. The following shall apply where applicable:
   a. Protect finished floors from chips and cutting oil by the use of metal chip receiving pans and oilproof floor covers.
   b. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.
   c. Protect equipment and finished surfaces from paint droppings, insulation adhesive, and sizing droppings, etc., by use of drop cloths.
3. Pumps, motors, fans, and other rotating/reciprocating equipment stored for this Project shall be adequately protected with openings, bearings, etc., covered to exclude dust and moisture. Stock piled pipe, valves, fittings, ductwork, etc., shall be placed on dunnage and protected from weather and from entry of foreign material.
4. During installation and until final connections are made, piping and ductwork shall be protected against entry of foreign matter. Equipment connections shall be carefully sealed until the actual time of system tie-in.

D. Accessibility
1. Provide a union or flange in the piping at each screwed or welded valve, device, or item of equipment, and elsewhere as required for accessibility of repair. Each union shall be so installed as to permit the removal of item without disconnection of any piping except at the union.

3.02 CONCRETE HOUSEKEEPING PADS

A. Contractor shall refer to Specification Secion 03 3000 for requirements of concrete housekeeping pads.

3.03 TESTING AND REPAIR

A. Upon completion of each respective piping system, but prior to insulating, covering, or backfilling, each system shall be thoroughly cleaned and flushed to remove construction dirt and foreign matter.

B. Test Piping as Specified Herein
1. No piping work shall be concealed or covered until it has been inspected and approved by the project inspector, who shall be notified when the Work is ready for inspection. Work shall be completely installed and tested as required by this Contract and Ordinances of the local Municipality and shall be leaktight to the satisfaction of those making the inspection and the Architect/ Engineer.
2. In general, pressure tests shall be applied to piping. In no case shall piping be subject to pressure exceeding its rating. Defective work shall be promptly repaired or replaced and

test shall be repeated until the particular system and component parts thereof receive approval of the Architect/Engineer.

3. Provide temporary equipment for testing, including pump, blower, and gauges. Test piping system before insulation is installed and remove control devices before testing. Test each natural section of each piping system independently, but do not use piping system valves or to isolate sections where test pressure exceeds valve pressure rating.
4. Repair piping system sections which fail required piping test by disassembly and reinstallation, using new materials to extent required to overcome leakage. Do not use chemicals, stopleak compounds, mastics, or other temporary repair methods.
5. Drain test water from piping systems after testing and repair work has been completed.
6. Pressure for Testing of Piping Systems shall be as follows:
   a. Fire Protection Piping System (Interior)
      1) Per NFPA #13, state and local codes.
7. Accurately record and report methods of testing, times, and dates of test, witnesses to the test, and the results of the test. Test reports shall be neatly typewritten on standard 8-1/2 inch by 11 inch sheets and submitted in 5 copies to Architect/Engineer for approval within 5 days after test has been performed.

C. Damage resulting from tests shall be repaired or damaged materials replaced, to satisfaction of Architect/Engineer, and at no cost to Owner.

3.04 EMERGENCY REPAIRS OR OPERATION

A. The Owner reserves the right to make emergency repairs and protection of the equipment and systems in operation without voiding the Contractor's guarantee bond or relieving the Contractor of his responsibility during the bonding period.

3.05 PROVISIONS FOR LATER INSTALLATIONS

A. Where work cannot be installed as the structure is being erected, the Contractor for such work shall provide and arrange for the building-in of boxes, sleeves, inserts, fixtures, and devices necessary to permit installation of the omitted work during later phases of construction. The Contractor shall arrange for layout, chases, holes, and other openings which must be provided in masonry, concrete, and other work.

B. The Contractor shall be responsible for becoming informed of the nature and arrangement of the materials and construction to which his work attached or passes through.

3.06 FINAL COMPLETION

A. Work shall be cleaned prior to Substantial Completion of the Work.

B. Retouch or repaint factory painted prime and finish coats where scratched or damaged. Whenever retouching will not be satisfactory, in the opinion of the Architect/Engineer, the Architect/Engineer has the option to require complete repainting until the desired appearance is obtained.

C. The Contractor shall clean equipment; restore damaged materials, remove grease, oil chemical, paint spots, and stains; and leave the Work in condition acceptable to Owner and Architect/Engineer.

D. On completion of his Work, the Contractor shall remove and see that each of his subcontractors removes from the site tools, equipment, surplus materials, and rubbish pertaining to his operations, and pay cost for such removal and disposition.

E. Contractor shall explain all components of the fire protection system and demonstrate their operation and maintenance to the owner's representative.
   1. All demonstrations and training shall be video-taped by the Fire Protection Contractor. Two copies shall be turned over to the owner's representative.

3.07 COORDINATION DRAWINGS

A. Division 23 Mechanical contractor shall be responsible for creating Coordination drawings. Division 21 Fire Protection contractor shall coordinate fire protection piping layout including fire protection mains with Division 23 Mechanical contractor to include work on coordination drawings.
   1. All coordination drawings are to be created with a 3D modeling software that is compatible with Autodesk Navisworks.

3.08 MAINTENANCE AND OPERATING MANUALS AND INSTRUCTIONS

A. Comply with Section 01 7800 and the following:

B. Bind the written operating instructions, shop drawings, equipment catalog cuts, and manufacturer's instructions into the binder with each section seperated by tabbed dividers. Material to be assembled as follows:
   1. First Page --Title of Job, Owner, Address, Date of submittal, Name of Contractor, and Name of Architect/Engineer. Emergency operating instructions and/or list of service organizations (including address and telephone numbers) capable of rendering emergency service on 24 hour calls.
   2. Second page--Index
   3. Sections--Each section shall include a subsection with a tab divider. The tab shall list the contents of the the divided section. There shall be a subsection that contains the following information:
      a. Written list of items requiring service and either state the service needed or refer to the manufacturer's data in the binder that described the proper service.
      b. A copy of the approved shop drawing for all systems, equipment, and components (clearly marked for item furnished).
      c. A copy of each manufacturer's operating instructions with an index at the beginning of the section.
      d. A list of equipment used on the job, Contractor's purchase order numbers, supplier's name, and address.
      e. A copy of the drawings and calculations.
   4. Maintenance and operating manuals, instructions and calculations shall be also forwarded in electronic format via USB flash drive. Folders shall be created for each section and subfolder for each fixture and/or equipment required for the project.

3.09 RECORD DRAWINGS

A. The Contractor shall keep a running record of each change and deviation from the Drawings. Record shall be kept clean and undamaged upon a set of Drawings used for no other purpose. Upon completion of the Project, the Contractor shall submit to the Architect/Engineer one complete set of drawings which have been corrected to show deviations plus "Project Record Drawing" and the Contractor's letterhead type information. With the submittal shall be 2 sets of prints made from the corrected drawings.
   1. CADD drawing option may be used by Contractor. Disks with specific Drawings are available from Architect/Engineer at a nominal charge. Contact Architect/Engineer for current fee.

B. Record Drawings shall show:
   1. Size, type, and capacity of materials, devices, or pieces of equipment.
   2. Location of devices or pieces of equipment.
   3. Routing of piping (above and below grade), or other building services.

C. These drawings shall also record the location of concealed piping by indication of measured dimensions to each such line from readily identifiable and accessible walls or corners of the building.

D. Record drawings must be complete and accurate with regard to concealed piping, like equipment, or devices. Unless record drawings are sufficiently accurate to permit immediate location and identification of concealed work with a minimum of cutting, record drawings will be considered inadequate and the contract work deemed incomplete.

END OF SECTION 21 05 01

SECTION 21 05 53
FIRE SUPPRESSION IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Riser Tags.

D. Fire Protection Riser Room Sign.

E. Pipe markers.

F. Ceiling tacks.

1.02 RELATED REQUIREMENTS

1. Section 01 3516 - LEED Submittal Forms
2. Section 01 3516.01 - Material Documentation Sheet
3. Section 01 5721 - IAQ Construction and Preoccupancy
4. Section 01 5721.01 - IAQ Planning Checklist
5. Section 01 5721.02 - IAQ Insepction Checklist
6. Section 01 5721.03 - IAQ Log
7. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
8. Section 01 6116.01 - Accessory Material VOC Content Certification Form.

B. Section 09 91 23 - Interior Painting: Stencil paint.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

1.04 SUBMITTALS

A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Product Data: Provide manufacturers catalog literature for each product required.

D. Manufacturer's Installation Instructions: Indicate special procedures, and installation instructions.

E. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

D. Fire Protection Products, Inc.: www.fppi.com

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.

3. Background Color: Black.

2.03 TAGS

A. Metal Tags: Brass with Stamped letters; letters to be filled with black ink; tag size minimum 1-1/2 inch diameter with smooth edges.

B. Chart: Typewritten letter size list in anodized aluminum frame. Five copies (or sets) of valve tag charts of valves shall be furnished; said charts shall include the following items:
   1. Valve Identification
   2. Locations
   3. Purpose

C. Mount one set of valve tag charts in an anodized aluminum frame with plastic and secured on a wall in the mechanical room or as otherwise directed. Second set of charts to be prepared for "trouble shooting". The third, fourth, and fifth charts shall be bound into the operating and maintenance manuals.

2.04 RISER TAGS

A. Provide a tag at each Fire Protection Riser.

B. Plastic Nameplate: Laminated three-layer plastic or aluminum with engraved letters.
   1. Color: Red with white lettering.

C. Mounting: Mount on wall directly behind each riser or hang from easy riser check valve with chain.

D. Information on tag: Fire protection zone being served by riser, tested flow rate, tested pressure drop at flow rate.

2.05 FIRE PROTECTION RISER ROOM SIGN

A. Plastic Nameplate: Laminated three-layer plastic with engraved letters.
   1. Color: Red with white lettering. Lettering height shall be minimum 3".
   2. Information on Tag: Sign shall read "FIRE SUPPRESSION RISER ROOM".

B. Location: Mount on outside of exterior door to Riser Room.

2.06 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.07 CEILING TACKS

A. Description: Steel with 3/4 inch diameter colored, pressure-sensitive adhesive paper circles. Apply circles to ceiling grid below location of system equipment per following code.

B. Color code as follows:
   1. Sprinkler Valves: Orange.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 91 23 for stencil painting.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Identify valves in main and branch piping with tags.

G. Mount Riser tags on wall directly behind respective riser or hang from riser with chain.

H. Install Fire Protection Riser Room Sign on exterior side of mechanical room exterior door. Secure with water resistant adhesive glue.

I. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

J. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 21 05 53

SECTION 21 13 00
FIRE PROTECTION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. Indicator Valves

C. System design, installation, and certification.

D. Fire department connections

E. Standpipe / Hose Cabinets

F. Double Check Detector Check Assembly

G. Reduced Pressure Zone Assembly

H. Pipe, fittings, valves, and connections for sprinkler, standpipe, and fire hose connections.

1.02 RELATED REQUIREMENTS

A. Commissioning
   1. Section 01 9113 - General Commissioning Requirements
   2. Section 01 9114 - Commissioning Authority Responsibility

B. Section 21 0501 - Fire Suppression Materials and Methods

C. Section 21 05 48 - Vibration and Seismic Control.

D. Section 21 05 53 - Fire Suppression Identification.

1.03 REFERENCE STANDARDS

A. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011.

B. ASSE 1015 - Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies; 2011.

C. ASSE 1047 - Performance Requirements for Reduced Pressure Detector Fire Protection Backflow Prevention Assemblies; 2011.

D. ASSE 1048 - Performance Requirements for Double Check Detector Fire Protection Backflow Prevention Assemblies; 2011.

E. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings; 2022.

F. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.

G. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).

H. AWWA C153/A21.53 - Ductile-Iron Compact Fittings; 2019.

I. Comply with state and Local Fire Codes

J. FM (AG) - FM Approval Guide; Factory Mutual Research Corporation; current edition.

K. ITS (DIR) - Directory of Listed Products; current edition.

L. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

M. UL (DIR) - Online Certifications Directory; Current Edition.

N. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless.

O. ASTM A 795 - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection use.

P. UL 312 - Check Valves for Fire Protection Service; Underwriters Laboratories, Inc.

Q. Comply with Factory Mutual Global "Approval Guide".

R. ASTM A234 - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel.

S. ASTM A536 - Standard Specification for Ductile Iron Castings.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Submit Fire Supression delegated designer qualifications with minimum 5 years documented expererience.
   2. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   3. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
   4. The owner will pay for the approval as required by the Ohio Basic Building Code with the sprinkler contractor submitting hydraulic calculations and drawings to the architect/engineer for state plan approval. The contractor shall secure and pay for all other building permits and governmental fees, licenses and inspections.
   5. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with applicable Victaulic style number.
   6. Sprinkler heads shall be referred to on drawings, submittals, and other documentation, by the sprinkler identification or Model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.

D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
   3. Sprinkler Wrenches: For each sprinkler type.

1.05 QUALITY ASSURANCE

A. Conform to UL and FM requirements.

B. Designer Qualifications: Fire supression system is a delgated design. Design system under direct supervision of a Professional Engineer with NICET Level III Ceexperienced in design of this type of work and licensed in Ohio.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

D. Equipment and Components: Provide products that bear UL and FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

E. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

F. Piping shall be installed per NFPA 13, state and local fire codes.

G. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer.

H. Testing of piping shall be per NFPA 13.

I. Sprinkler heads shall be UL and FM labeled and shall be located on spacing requirements as noted in NFPA 13 according to the hazard designation. Extended coverage sprinkler heads are acceptable.

J. Stand pipes and hose cabinets shall be provided per NFPA 14, state and local codes.

K. Backflow preventers shall meet the current requirements of ASSE 1013, ASSE 1015, ASSE 1047 and/or ASSE 1048.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 MAINTENANCE SERVICE

A. Provide service and maintenance of fire protection system for one year from date of Substantial Completion.

B. Contractor shall explain all components of the fire protection system and demonstrate their operation and maintenance to the owner's representative.
   1. All demonstrations and training shall be video-taped by the Fire Protection Contractor. Two copies shall be turned over to the owner's representative.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:
   1. Victaulic Corp.
   2. Viking Corp.
   3. Grinnell Corp.
   4. Globe Fire Sprinkler Co.
   5. Reliable Automatic Sprinkler Co., Inc.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL SYSTEM AND PRODUCT REQUIREMENTS

A. Sprinkler System: Conform to NFPA 13.

B. Standpipe and Hose Systems: Conform to NFPA 14.

C. Welding Materials and Procedures: Conform to ASME Code.

2.03 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for building areas noted.

B. Occupancy: Light hazard; comply with NFPA 13. Provide ordinary hazard in spaces where required and/or noted.

C. Water Supply: Determine volume and pressure from water flow test data.
   1. If test data is not available assume XXX gpm at XX psig residual and XX psig static
   2. Contractor shall perform their own flow test before submission of submittal drawings. Design shall be revised to reflect contractor's flow test.
   3. The contractor shall perform a flow test during construction and a final flow test before startup to verify design conditions.

D. Interface system with building fire and smoke alarm system.

E. Provide fire department connections where indicated.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.04 SPRINKLERS

A. Provide automatic sprinklers as listed by UL and F.M. Global
   1. Sprinkler heads shall be fusible solder link or glass bulb type. Body shall be die cast brass, with hex-shaped wrench boss cast into body to facilitate installation and reduce the risk of damage during installation.
   2. Provide brass upright pendant and side wall sprinklers as required on exposed piping in unfinished spaces.
   3. Provide white exposed pendant sprinkler heads in finished areas such as storage rooms and janitors closets.
   4. Provide white semi-recessed pendant heads with matching escutcheon in all finished areas except as noted.
   5. Provide concealed ceiling sprinklers with cover plate to match ceiling color in the corridors, restrooms, hard surface ceiling, bulkheads and locker/shower rooms.
   6. Provide recessed pendant type, dry sprinklers in cooler and freezer areas.
   7. Center heads in ceiling tile in corridors. All other heads in lay-in ceiling areas shall be in tile not within 4 inches of grid.
   8. Provide bolt or screw fastened, heavy duty wire guards for sprinkler heads in gymnasiums and mechanical rooms. Heavy duty wire guards shall be equal to Victaulic Firelock Heavy Duty Sprinkler Guards.
   9. Escutcheons and guards shall be listed, supplied and approved for use with the sprinkler piping by the sprinkler manufacturer.

B. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Brass.
   4. Fusible Element: Solder link or glass bulb type temperature rated for specific area hazard.
   5. Connection type: NPT or Grooved

C. Suspended Ceiling Type: Concealed pendant type with matching push on escutcheon plate.
   1. Response Type: Quick
   2. Coverage Type: Standard or Extended.
   3. Finish: Enamel, color White except for other spaces that have different colored ceilings, which shall be color as selected by Architect.
   4. Escutcheon Plate Finish: Enamel, color White except for other spaces that have different colored ceilings, which shall be color as selected by Architect.
   5. Glass bulb type temperature rated for specific area hazard.
   6. Connection type: NPT or Grooved

D. Exposed Area Type: Pendant type with guard.
   1. Response Type: Quick.

2. Coverage Type: Standard or Extended
3. Finish: Brass.
4. Fusible Element: Solder link or glass bulb type temperature rated for specific area hazard.
5. Connection type: NPT or Grooved

E. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
1. Response Type: Quick.
2. Coverage Type: Standard or Extended .
3. Finish: Brass.
4. Fusible Element: Solder link or glass bulb type temperature rated for specific area hazard.
5. Connection type: NPT

F. Guards: Finish to match sprinkler finish.

2.05 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
1. Activate electric alarm.
2. Test and drain valve.
3. Replaceable internal components without removing valve from installed position.

B. Provide vane type waterflow indicator with tamper switch and electronic retard adjustable up to 90 seconds. Units shall comply with NFPA #71 and #72. Provide equal to Systems Sensor model WFD or Potter Electric VSR-F waterflow indicator.

C. Provide a valve position supervisory switch for monitoring W.I.V. valve. Provide equal to System Sensor OSY2 ,Potter Electric PCVS or OSYSU-A2, or Viking VSR-D supervisory switch.

D. Provide a test station for testing alarm systems. Provide control valve test and drain assembly. Locate test stations in janitors closets, drain to floor service sinks.

E. Provide grooved check valves and butterfly valves with tamper units in locations as required. Coordinate locations and connections with electrical contractor.

F. Provide an easy riser check valve at each zone takeoff from the incoming water main.
1. Check valves utilized in the sprinkler system riser, which are 2-1/2 inch in size, shall be equipped with grooved inlet and grooved outlet connections. Sprinkler riser check valves shall be manufactured with supply side and system side gauge connections and a main drain outlet in conformance with N.F.P.A. 13, Standard for Installation of Sprinkler Systems. The 2-1/2 inch check valves shall be UL Listed and Factory Mutual Approved for use on fire protection systems. Check valves shall be constructed of a ductile iron body with a brass seat and a rubber faced clapper assembly hinged to a removable access cover. Check valves shall be equipped with a removable access cover for periodic inspection as required in N.F.P.A. 25, Standard for Inspection, Testing and Maintenance of Water-Based Fire Protection Systems. The 2-1/2 inch check valves shall have a working water pressure of 250 PSI (17 BAR).
2. Check valves utilized in the sprinkler system riser, which are 3 inch to 8 inch in size, shall be UL Listed and Factory Mutual Approved for use on fire protection systems. Sprinkler riser check valves shall be manufactured with supply side and system side gauge connections and a main drain outlet in conformance with N.F.P.A. 13, Standard for Installation of Sprinkler Systems. Check valves shall be constructed of a ductile iron body with a brass seat and a rubber faced clapper assembly hinged to a removable access cover. Check valves shall be equipped with a removable access cover for periodic

inspection as required in N.F.P.A. 25, Standard for Inspection, Testing and Maintenance of Water-Based Fire Protection Systems. Check valves shall have a working water pressure of 250 PSI (17 BAR).

3. Universal Manifold Check Valve: Universal manifold check valves, ductile iron construction, incorporating a control valve, check valve, flow switch, test & drain assembly, adjustable relief valve, and system gauges in one compact body/footprint, and shall be manufactured for "right" and "left"-hand orientations. The test & drain assemble shall contain an adjustable relief valve, with a range of 175 to 310 psi, and a universal test orifice of K2.8; to provide testing capabilities of systems with k-factors ranging from K2.8 and larger. Universal manifold check valve shall be rated for use at the maximum service pressure of 300 psi and shall be UL listed and FM approved. Basis of Design: Globe Fire Sprinkler Corporation Model UMC.

G. Electric Alarm: Provide 120V, electrically operated, 8" chrome plated gong with pressure alarm switch. Gong shall be installed by the electrical contractor. Coordinate the exact location with the electrical contractor.

H. Fire Department Connections:
   1. Outlets: One 5" Storz.
   2. Where applicable, install a 90-degree elbow with drain connection at each Fire Department connection, equal to Victaulic #10-DR.

I. Indicator Valves
   1. Wall and Post Indicator Valve, UL listed and FM approved.
   2. Indicator of open or shut positions
   3. Wrench handle fits over a 'U' bracket on the barrel which can be fixed with a padlock.
   4. Internally and externally coated in red epoxy.
   5. Provide with tamper switch for the fire alarm to connect to. Coordinate location of post indicator valve with the electric and fire alarm contractors.

J. Fire Hose Cabinets
   1. Hose Cabinets:
      a. Style: Surface mounted.
      b. Door: 12 gage thick steel, flush, glazed with 6 mm thick wired glass full panel; hinged, positive latch device.
      c. Finish: Enameled, color red.
   2. Hose Rack: Steel with polished chrome finish; swivel type with pins and water stop.
   3. Hose: 1-1/2 inch diameter, 50 feet long, of linen hose; mildew and rot-resistant.
   4. Nozzle: Chrome plated brass; combination fog, straight stream, and adjustable shut-off.

2.06 BURIED PIPING

A. Steel Pipe: ASTM A 53/A 53M Schedule 40, ASTM A 135 Schedule 10, ASTM A 795 Standard Weight, or ASME B36.10M Schedule 40, black, with AWWA C105 polyethylene jacket, or double layer, half-lapped polyethylene tape.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded; with double layer, half-lapped polyethylene tape.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
   3. Joints: Welded in accordance with AWS D1.1.

B. Ductile Iron Pipe: AWWA C151/A21.51, AWWA C104/A21.4 cement mortar lining.
   1. Ductile Iron Fittings: flanged or mechanical joint ends complying with AWWA C153/A21.53, AWWA C104/A21.4 cement mortar lining. Include AWWA C111/A21.11 ductile iron glands, rubber gaskets and stainless steel bolts, with AWWA C105 polyethylene jacket, or double layer, half-lapped polyethylene tape

2. Ductile Iron Joints: flanged or mechanical joint ends complying with AWWA C153/A21.53, AWWA C104/A21.4 cement mortar lining. Include AWWA C111/A21.11 ductile iron glands, rubber gaskets and stainless steel bolts, with AWWA C105 polyethylene jacket, or double layer, half-lapped polyethylene tape
3. Pressure rating for 250 psig minimum.

C. PVC Pipe: AWWA C900, CL 150, DR-18.
1. Fittings: Cement Lined ductile iron mechanical joint type.

2.07 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A 795 Schedule 10, ASTM A 53 Schedule 40, or ASTM A 135/795 Schedule 40, black.
1. Steel Fittings: ASME B16.9, wrought steel, buttwelded.
2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
3. Mechanical Grooved Fittings: Ductile iron, conforming to ASTM A 536; forged steel, conforming to ASTM A 234; or factory-fabricated from carbon steel pipe, conforming to ASTM A 53; with grooved ends conforming to ANSI/AWWA C606.
4. Mechanical Grooved Couplings: Ductile iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
   a. Rigid Type: Coupling housings cast with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with NFPA 13. Tongue and recess rigid type couplings shall only be used if the contractor uses a torque wrench for installation. Required torque shall be in accordance with the manufacturer's latest recommendations. This shall be field verified by the engineer's field representative.
      1) 1-1/4" through 12" rigid coupling shall be "Installation Ready" stab-on type coupling, designed for direct "stab" onto grooved end pipe without prior field disassembly and no loose parts.
      2) Center-leg gasket with pipe stop to ensure proper groove engagement, alignment, and piping insertion depth.
   b. Flexible Type: Use in locations where vibration attenuation and stress relief are required.
   c. Flange Adapter: Flat face, for direct connection to ANSI Class 125/150 flanged components.
5. Installation-Ready fittings for schedule 40 and schedule 10 grooved end steel piping in fire protection application sizes NPS 1 1/4" thru 2 1/2". Fittings shall be equal to Victaulic Firelock.
6. Installation ready fittings for schedule 40 and schedule 10 fittings and couplings may be used for 1" NPS carbon steel piping. Fittings shall be equal to Victaulic Firelock IGS.

B. Flexible Hose Sprinkler Head Connection: Flexible sprinkler connection assemblies shall be fully welded, non-mechanical fitting type, with minimum 1 inch internal diameter corrugated type 304 stainless steel hose, type 304 stainless steel braided outer cover and collar, 1 inch NPT male inlet and stainless steel or carbon steel 1 inch x 1/2 inch or 1 inch x 3/4 inch NPT female reducer outlet. Seals, when utilized shall be EPDM. Open gate ceiling bracket shall be direct attachment type having integrated snap-on clip ends positively attached to the ceiling using tamper-resistant screws and a removable attachment hub with a set screw. Ceiling attachment shall incorporate a tamper resistant label for visual verification of inappropriate removal or relocation. The flexible sprinkler connection assembly shall be UL listed and FM global approved for fire protection service, and seismically qualified pursuant to ICCESAC-156.

Assembly shall be equal to Victaulic AH2 or AH2-CC series. Sprinkler heads shall be equal to Victaulic VicFlex with Victaulic Firelock IGS grooved style 108 fitting.

C. In lieu of dry type rigid sprinkler heads, a flexible hose sprinkler head connection equal to Victaulic VicFlex dryer sprinkler model VS1. The sprinkler shall provide a vertical or horizontal flexible connection with a bend radius to 2" and allow for up to four bends. Provide bracket equal to Victaulic AB6 bracket.

2.08 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports per NFPA 14 requirements.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis, or malleable iron, adjustable swivel, split ring.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

G. Structural Supports shall be beam clamps, sloped beam clamps, or strap in strut mount hangers.
   1. Arrange all mechanical supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.
   2. If support must occur between panel joints, then threaded rods shall be dropped from both panel points, an adequate angle to both, and then the support attached to the angle is required.
   3. Unless specifically indicated or approved by Garmann Miller & Associates Inc. do not provide support from roof decks or floor decks.

H. Vertical Support: Steel riser clamp.

2.09 DOUBLE CHECK DETECTOR CHECK VALVE ASSEMBLIES

A. Double Check Detector Check Valve Manufacturers:
   1. Wilkins; Model 350ADA
   2. Watts Regulator Company; Model 774DCDA.
   3. Ames; Model 2000SS.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Double Check Detector Check Valve Assemblies:
   1. ASSE 1048; Epoxy coated ductile iron body with stainless steel internal parts, corrosion resistant internal parts and stainless steel springs; two positive seating check valves located between two resilient seated shutoffs with a hydraulically balanced bypass line and test cocks. There shall be no brass or bronze parts used within the check valve assembly.
      a. The bypass line shall be hydraulically sized to accurately measure low flow. The bypass line shall consist of a meter, a small diameter double check assembly with test cocks and isolation valves. The bypass line double check valve shall have a single access cover, two independently operating modular poppet check valves, and top mounted test cocks.

2.10 REDUCED PRESSURE ZONE ASSEMBLIES

A. Reduced Pressure Zone Assemblies Manufacturers:
   1. Wilkins.
   2. Watts Regulator Company.
   3. Conbraco Industries.

4. ITT Lawler.
5. Ames; ; Model 4000SS.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reduce Pressure Zone Assemblies:
1. ASSE 1013; Stainless steel body with stainless steel internal parts, corrosion resistant internal parts and stainless steel springs; pressure differential relief valves located between two positive seating check assemblies and two resilient seated shutoffs with a hydraulically balanced bypass line and test cocks. There shall be no brass or bronze parts used within the check valve assembly relief valve.
a. The bypass line shall be hydraulically sized to accurately measure low flow. The bypass line shall consist of a meter, a small diameter double check assembly with test cocks and isolation valves. The bypass line double check valve shall have a single access cover, two independently operating modular poppet check valves, and top mounted test cocks.

2.11 GLOBE OR ANGLE VALVES

A. Up to and including 2 inches:
1. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity repackable under pressure.

B. Over 2 inches:
1. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.12 BALL VALVES

A. Up to and including 2 inches:
1. Bronze two piece body, chrome plated brass, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends with union.
2. Brass two piece body, chrome plated brass, or stainless steel ball, Teflon seats, weatherproof actuator housing, worm gear operated, threaded or grooved ends.

B. Over 2 inches:
1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive hand wheel for sizes 10 inches and over, flanged.
2. Ductile iron body, chrome plated carbon steel ball and stem, Teflon seats, lever handle and grooved ends.

2.13 BUTTERFLY VALVES

A. Bronze Body:
1. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.

B. Cast or Ductile Iron Body
1. Electroless-nickel coated ductile iron disc, stem offset from the disc centerline to provide a complete 360 degree circumferential seating, grooved ends, weatherproof actuator housing with handwheel and gear drive, and integral indicating device, and built-in tamper proof switch rated 10 amp at 125 volt AC. Valve shall be equal to Victaulic Series 705.

2.14 CHECK VALVES

A. Up to and including 2 inches:
1. Bronze body and swing disc, rubber seat, threaded ends.

B. Over 2 inches:

1. Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends with automatic ball check.
2. Ductile iron body, stainless steel trim, spring-assisted check for vertical or horizontal installation, with aluminum bronze or elastomer encapsulated ductile iron disc; grooved ends. Valve shall be equal to Victaulic Series 717.

C. 4 inches and Over:
1. Iron body, bronze disc, stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

2.15 DRAIN VALVES

A. Compression Stop:
1. Bronze with hose thread nipple and cap.

B. Ball Valve:
1. Brass with cap and chain, 3/4 inch hose thread.

2.16 MANIFOLDS | FLOOR CONTROL ASSEMBLIES | RISERS

2.17

A. maximum service pressure of 300 psi and shall be UL listed and FM approved. Basis of Design:

B. Victaulic Series UMC

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.

B. Prepare piping connections to equipment with grooved joint couplings, flanges or unions.

C. Clean pipe to prevent MIC (Microbially Influenced Corrosion).

D. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Prepare piping connections to equipment with grooved joint couplings, flanges or unions.

C. Install standpipe piping, hangers, and supports in accordance with NFPA 14.

D. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

E. Install piping to conserve building space, to not interfere with use of space and other work.

F. Group piping whenever practical at common elevations.

G. Sleeve pipes passing through partitions, walls, and floors.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Pipe Hangers and Supports:
1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
6. All hangers shall be located at steel joists panel points.

J. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

K. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 09 9000.

L. Do not penetrate building structural members unless indicated.

M. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

N. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.

O. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

P. Provide drain valves at main shut-off valves, low points of piping and apparatus.

Q. Install equipment in accordance with manufacturer's instructions.

R. Provide approved double check valve assembly at sprinkler system water source connection.

S. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

T. Locate outside alarm gong on building wall as required by NFPA and local authority having jurisdication. Coordinate exact location with electrical contractor.

U. Place pipe runs to minimize obstruction to other work.

V. Place piping in concealed spaces above finished ceilings.

W. Center sprinklers in two directions in ceiling tile and provide piping offsets as required. All other sprinkler heads in lay-in ceiling areas shall be in tile to within 4 inches of grid.

X. Do not install sprinklers that have been dropped, damaged, show a visible loss of fluid, or a cracked bulb.

Y. The sprinkler bulb protector shall be removable by hand, without tools or devices that may damage the bulb.

Z. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

AA. Flush entire piping system of foreign matter.

BB. Install guards on sprinklers in gymnasiums and where indicated on drawings..

CC. Hydrostatically test entire system.

DD. Require test be witnessed by Fire Marshal.

EE. Grooved Joints: All grooved couplings, fittings, valves and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections

and roll marks in the area from the pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically inspect the product installation. Contractor shall remove and replace any improperly installed products.

FF. Locking Lug (FIT®) Joints: Pipe ends shall be square cut and thoroughly clean on the OD, for 1" from the pipe end to remove pipe coatings, mill scale, rust and raised weld beads. OD burrs and sharp edges shall be removed. Pipe shall be marked 1-1/2" from the end and pipe end configuration shall be in conformance with manufacturer specifications.

GG. Vic-Press® Joints: Pipe shall be square cut, +/- 0.030", properly deburred and cleaned. Pipe ends shall be marked at the required location, using a manufacturer-supplied gauge, to ensure full insertion into the coupling or fitting during assembly. Use a manufacturer approved tool with the proper sized jaw for pressing.

3.03 TESTING AND REPAIR

A. Upon completion of each respective piping/ductwork system, but prior to insulating, covering, or backfilling, each system shall be thoroughly cleaned and flushed to remove construction dirt and foreign matter.

B. Test Piping per the NFPA and as Specified Herein
   1. No piping work shall be concealed or covered until it has been inspected and approved by the project inspector, who shall be notified when the Work is ready for inspection. Work shall be completely installed and tested as required by this Contract and Ordinances of the local Municipality and shall be leaktight to the satisfaction of those making the inspection and the Architect/ Engineer.
   2. In general, pressure tests shall be applied to piping. In no case shall piping be subject to pressure exceeding its rating. Defective work shall be promptly repaired or replaced and test shall be repeated until the particular system and component parts thereof receive approval of the Architect/Engineer.
   3. Provide temporary equipment for testing, including pump, blower, and gauges. Test piping system before insulation is installed and remove control devices before testing. Test each natural section of each piping system independently, but do not use piping system valves or to isolate sections where test pressure exceeds valve pressure rating.
   4. Repair piping system sections which fail required piping test by disassembly and reinstallation, using new materials to extent required to overcome leakage. Do not use chemicals, stopleak compounds, mastics, or other temporary repair methods.
   5. Drain test water from piping systems after testing and repair work has been completed.
   6. Pressure for Testing of Piping Systems shall be as follows:
      a. Fire Protection Piping System (Interior)
         1) Per NFPA #13, state and local codes.
   7. Accurately record and report methods of testing, times, and dates of test, witnesses to the test, and the results of the test. Test reports shall be neatly typewritten on standard 8-1/2 inch by 11 inch sheets and submitted in 5 copies to Architect/Engineer for approval within 5 days after test has been performed.

C. Damage resulting from tests shall be repaired or damaged materials replaced, to satisfaction of Architect/Engineer, and at no cost to Owner.

END OF SECTION 21 13 00

SECTION 22 05 01
PLUMBING MATERIALS & METHODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping specialties
B. Lubrication and packing
C. Installation requirements common to piping systems and equipment specification sections
D. Concrete Housekeeping Pads.
E. Emergency repairs or operation
F. Provisions for later installations
G. Final completion
H. Project Conditions
I. Quality Assurance
J. Warranty
K. Supervision and cooperation
L. Coordination Drawings
M. Maintenance and operating manuals
N. Record drawings

1.02 RELATED REQUIREMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1 and 2, General Requirements, are included as a part of this Section as though bound herein.
B. Commissioning
   1. Section 01 9113 - General Commissioning Requirements
   2. Section 01 9114 - Commissioning Authority Responsibility
C. Refer to Section 07 8400 - Firestopping. Electrical Contractor shall provide submittals for fire stopping based on Section 07 8400.
D. Refer to Division 26, Electrical Specifications, and to the requirements stated therein applicable to the Mechanical Work, where coordination of trades is covered.
E. The Drawings prepared for this Project are an outline to show where pipes, and apparatus must go in order to harmonize with the building and installations of the various trades. Work must be installed in accordance with the Drawings insofar as possible. Drawings shall be carefully checked during the course of bidding and construction. If discrepancies, errors, or omissions are discovered prior to or during the construction phase, notify the Engineer immediately for interpretation or correction. Take necessary measurements and be responsible for same, including clearances for equipment that is to be furnished. The Architect/Engineer shall reserve the right to make minor location changes of piping and equipment where such adjustments are deemed desirable from an appearance or operational standpoint. Such changes will be anticipated sufficiently in advance to avoid extra work or unduly delay progress on the Project.
F. The general building drawings shall be used to obtain dimensions and exact locations and as a check with other Contractors to avoid interferences with their Work. Refer to applicable Drawings on branches of the Work where other trades are involved on the Project so that added field work and job delays resulting from conflicts between crafts can be avoided. Piping

that is prefabricated before coordinating with the other trades may have to be redone at no additional cost if conflicts are encountered.

1.03 SUMMARY

A. The Contractor(s) shall provide the labor, materials, equipment, appliances, services and transportation, and perform the operations in connection with the construction and installation of the Work. Work shall be as herein specified and as denoted on the accompanying Drawings.

B. The Contractor(s) shall arrange and pay for permits and inspections required in connection with the Work. The Contractor shall apply for and pay for meters, regulators, recorders, and gauges required. The Contractor must present to the Owner through the Architect/Engineer, properly signed certificates of final inspection by the governing authorities when they become due and shall not cover up Work until approved by those authorities.

C. The Contractor(s) shall make arrangements for connection of the permanent utilities (gas); include connection costs as part of the Work under this Contract. Verify exact requirements of the utility with regard to such service; and include in the Work costs related to same.

D. Materials or labor obviously required to fully complete the Work shall be included, even though each item necessarily involved is not specifically mentioned or shown. Such Work and materials shall be furnished and shall be of the same grade or quality as the parts actually specified and shown. Should there be a conflict between the plans and Specifications, the greater quantity and better quality shall be furnished.

E. Should an overlap of Work between the various trades become evident, the Engineer shall be notified. Such an event shall not relieve the Contractor of the responsibility for the Work called for under his branch of the Specifications until a written clarification or directive is issued concerning the matter.

F. Related Work Specified Elsewhere
   1. Firestopping is Work of this Section though fire barrier sealants (firestopping) for walls and floors are specified in Section 07 8400. Contractors are responsible for proper sizing of their sleeves and core-drilled holes so that they are at least 1-1/2 inches larger in diameter than the penetrating items. Schedule 40 steel sleeves and core-drilled holes made excessively large or made and not used, will be firestopped and charged to the Contractor who was responsible.

G. Related Work by Others
   1. Electric power wiring shall be included as Work under the electrical wiring section of Division 26, Electrical, except as follows:
      a. Control wiring regardless of voltage shall be included as Work under specific Sections of Division 22.
      b. Internal package type wiring as specified under specific Sections of Division 22.

H. Cutting of water lines, electric conduit, or similar service lines in the course of Work performed under this Section shall be immediately repaired as part of the Work of this Section.

1.04 REFERENCE STANDARDS

A. Standards are described by reference to various associations. These are in addition, but not limited to, to those listed in:
   1. AGA American Gas Association
   2. ANSI American National Standards Institute
   3. ASHRAE American Society of Heating, Refrigeration, and Air Conditioning Engineers
   4. ASME American Society of Mechanical Engineers
   5. ASPE American Society of Plumbing Engineers
   6. AWS American Welding Society

7. AWWA American Water Works Association
8. CISPI Cast Iron Soil Pipe Institute
9. NFPA National Fire Protection Association
10. OSHA Occupational Safety and Health Act
11. SMACNA Sheet Metal and Air Conditioning Contractors National Association
12. UL Underwriters' Laboratories, Inc.

B. Work shall be in complete accordance with codes, rules, and ordinances, regulations of authorities, bodies, associations, and governments, having proper or legal jurisdiction. Specifically, the following requirements shall be met in their entirety.
1. State and Local Rules, Regulations, Codes, Statutes, and Ordinances
2. Ohio Plumbing Code, 2017 Edition
3. ASHRAE 90.1-2010; Energy Standard for Buildings Except Low Rise Residential Buildings
4. NFPA 54 - National Fuel Gas Code
5. NFPA 70 - National Electrical Code; National Fire Protection Association; 2017 applicable requirements.
6. National Board of Fire Underwriters
7. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 1993 (and Revision 1,2,3).
8. Other Codes and Standards as specifically noted in each Section of the Specifications.
9. Americans with Disabilities Act (ADA)

C. References made to codes and standards, in these Specifications or on the Drawings, shall be taken to mean the latest edition, amendment, or revision of such reference in effect as of the date indicated on the Bid Documents unless otherwise noted.

1.05 SUBMITTALS

A. Submit capacity requirements, catalog cuts, and illustrations in accordance with requirements of specifications and as required by specific Sections of this Specification.

B. Shop Drawings shall be prepared by the Contractor or supplier.
1. Where limited space is available due to the nature of the Work, the requirements for shop and working drawings will apply, and the Contractor is required to prepare complete shop drawings showing the exact disposition of apparatus, equipment, piping, ductwork, and the like, and its relation to the building so there will be no irregularities or interferences. Shop drawings shall be prepared in coordination with other Contractors and other trades.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Instruments used by the Contractor shall be accurately calibrated and maintained in good working condition.

B. Products and test instruments used shall be subject to approval of Architect/Engineer.

C. Products and test instruments used shall be provided by each respective Contractor.

D. Note that systems involved under this Contract heading shall be in accordance with applicable requirements listed in NFPA Standard 90A.

E. Materials used in this Contract shall be those specified herein unless proposals for the use of alternate materials have been submitted and accepted in writing, as provided hereinbefore. Materials shall be strictly first grade of their kind and shall be new and in first-class condition when installed. Damaged materials will be rejected and must be replaced by proper and

acceptable materials. Materials shall be similar and in accordance with the provisions of this Specification.

F. No materials or equipment may be installed under this contract heading which do not meet the approval of the authorities having jurisdiction. Specific materials may have certain restrictions or exclusions as to their usage, including where they may not be located. Such regulations shall be adhered to where applicable. The requirements and regulations of the local and state building codes and regulations currently adopted shall be adhered to.

G. Piping systems shall be installed by workmen having skills acquired by working at the trade which is recognized as necessary for competency.

H. Pressure piping systems installed shall conform to the requirements of the State piping and welding codes where applicable.

1.07 PROJECT CONDITIONS

A. Unless otherwise stipulated under a particular heading, the following rules relative to responsibilities of the several Contractors and subcontractors will apply.
   1. Each Contractor shall install roughing-in work pertaining to his trade for connection of Work performed under other Sections of these Specifications.

B. Certain areas will be designated for the storage of materials and equipment and cooperation with the Owner in minimizing interference with existing operations will be mandatory.
   1. Where possible, store materials inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.
   2. Follow manufacturer's instructions for receiving, inspecting, handling, storage, and protection of products prior to final installation

C. Equipment Clearances and Requirements
   1. For many items of equipment described in these Specifications, several manufacturers are listed. The manufacturer listed on the drawings is the make on which the layout was based and on which clearances, service required electrical, and plumbing characteristics, etc., have been checked. Additional manufacturers listed are considered acceptable.
   2. Due to the possibility of restrictions imposed by space limitations, the responsibility for resolving conflicts resulting from the use of equipment other than first named shall rest with the equipment supplier and the Contractor. Submittals for this equipment will be considered as a statement that clearances for access, service, maintenance, etc., have been checked and found adequate.
   3. Alternate equipment or the equipment of additional manufacturers named in these documents shall meet Base Bid Specifications. In the event such equipment or any equipment which the bidder proposes to furnish, deviates from the requirements of equipment first named regarding electric service, power wiring, control wiring, plumbing or piping, sound attenuation, or vibration damping, it shall be the responsibility of the bidder to include in his price a sufficient sum to cover additional costs or charges resulting therefrom.

D. In general, the piping shown on the Drawings shall be considered as diagrammatic for clearness in indicating the general run and connections required, and may not be shown in its true position. The piping and equipment may have to be offset, lowered or raised, as required, or as directed at the site in order to accommodate field conditions.

1.08 SUPERVISION AND COOPERATION

A. Work done by the Contractor under this Division shall include the services of an experienced superintendent, who shall be constantly in charge of the work, together with the qualified journeymen, helpers, and laborers required to properly unload, install, connect, adjust, start,

and operate, and test the Work involved, including related equipment and materials furnished under other contracts or by the Owner.

B. A Pre-Installation meeting shall convene one week before starting work of this section.

1.09 WARRANTY

A. See Section 01 7000 - Closeout Procedures, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide motors and starter/disconnect switches having the voltage and electrical characteristics of the service available and where denoted on Drawings or as required.
   1. All motors shall be high efficiency type.

2.02 ESCUTCHEONS AND PLATES

A. Provide approved plates around each pipe passing through walls, floors, partitions, and ceilings when piping is exposed to view and on exterior of building. Plates shall be chrome-plated metal and sized to cover exposed ends of pipe insulation and pipe sleeves.

B. Floor plates shall be split-type, heavy chrome-plated and securely attached to the pipe.

2.03 PIPE SLEEVES

A. Steel pipe sleeves shall be fabricated from Schedule 40 galvanized steel pipe.

B. Sleeves for copper piping shall be of compatible material to prevent interaction of piping materials.

PART 3 EXECUTION

3.01 INSTALLATION

A. Cutting and Patching
   1. Cutting and drilling of walls, slabs, and structural members, required in conjunction with Work under this Section, shall be done under the supervision of the Architect/Engineer. Work shall be neatly done, removing no unnecessary material. Holes, openings, etc., shall be located where they will not weaken the structure. No beams, joists, etc., shall be cut without the written consent of the Architect/Engineer.
   2. Cutting of holes in masonry and concrete shall be performed with a core drill to minimize spalling, and limit damage to wall. Locations shall be accurately determined and checked, and the appropriate drill bit shall be used to minimize hole size.
   3. Sleeves or thimbles for holes as well as escutcheons and trim plates shall be provided. Installation shall permit free movement of pipe.
   4. Patching of work, where necessary, is to be done by a mechanic of the appropriate trade. Unless otherwise noted, patching for Work performed under this Section shall be immediately repaired as part of the Work of this Section.

B. Pipe Sleeves: Install pipe sleeves where piping passes through walls, floors, ceilings, and roofs.
   1. Do not install sleeves through structural members of work, except as detailed on Drawings, or as reviewed and approved by Architect/Engineer.
   2. Install sleeves accurately centered on pipe runs.
   3. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run.

4. Where insulation includes vapor barrier jacket, provide sleeve with sufficient clearance for installation.
5. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves.
6. Extend floor sleeves 1/4 inch above level floor finish, and 3/4 inch above floor finish sloped to drain unless otherwise noted.
7. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.
8. Where insulated piping passes through fire barriers, stop insulation at barrier for fire barrier penetration seal.
9. Where piping passes through non-fire rated, or non-waterproof, partitions, floors, and walls, apply pipe insulation continuous through pipe sleeves.
10. Do not install sleeves through suspended ceilings.
11. Caulk non-fire rated sleeves with sealant.

C. Protection
1. Provide proper protection to the building during the execution of Work involved under this contract heading.
2. This protection shall include covering apparatus, building surfaces, and other materials to protect same from dirt; adequate temporary connections to protect apparatus from damage and required shielding to protect finished parts of the building. The following shall apply where applicable:
   a. Protect finished floors from chips and cutting oil by the use of metal chip receiving pans and oilproof floor covers.
   b. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.
   c. Protect equipment and finished surfaces from paint droppings, insulation adhesive, and sizing droppings, etc., by use of drop cloths.
3. Pumps, motors, fans, and other rotating/reciprocating equipment stored for this Project shall be adequately protected with openings, bearings, etc., covered to exclude dust and moisture. Stock piled pipe, valves, fittings, ductwork, etc., shall be placed on dunnage and protected from weather and from entry of foreign material.
4. During installation and until final connections are made, piping and ductwork shall be protected against entry of foreign matter. Equipment connections shall be carefully sealed until the actual time of system tie-in.

D. Accessibility
1. Provide a union or flange in the piping at each screwed or welded valve, device, or item of equipment, and elsewhere as required for accessibility of repair. Each union shall be so installed as to permit the removal of item without disconnection of any piping except at the union.

3.02 CONCRETE HOUSEKEEPING PADS

A. Contractor shall refer to Specification Section 03 3000 for requirements of concrete housekeeping pads.

3.03 EMERGENCY REPAIRS OR OPERATION

A. The Owner reserves the right to make emergency repairs and protection of the equipment and systems in operation without voiding the Contractor's guarantee bond or relieving the Contractor of his responsibility during the bonding period.

3.04 PROVISIONS FOR LATER INSTALLATIONS

A. Where work cannot be installed as the structure is being erected, the Contractor for such work shall provide and arrange for the building-in of boxes, sleeves, inserts, fixtures, and devices necessary to permit installation of the omitted work during later phases of construction. The Contractor shall arrange for layout, chases, holes, and other openings which must be provided in masonry, concrete, and other work.

B. The Contractor shall be responsible for becoming informed of the nature and arrangement of the materials and construction to which his work attached or passes through.

3.05 FINAL COMPLETION

A. Work shall be cleaned prior to Substantial Completion of the Work.

B. Retouch or repaint factory painted prime and finish coats where scratched or damaged. Whenever retouching will not be satisfactory, in the opinion of the Architect/Engineer, the Architect/Engineer has the option to require complete repainting until the desired appearance is obtained.

C. The Contractor shall clean equipment; restore damaged materials, remove grease, oil chemical, paint spots, and stains; and leave the Work in condition acceptable to Owner and Architect/Engineer.

D. On completion of his Work, the Contractor shall remove and see that each of his subcontractors removes from the site tools, equipment, surplus materials, and rubbish pertaining to his operations, and pay cost for such removal and disposition.

E. Contractor shall explain all components of the plumbing system and demonstrate their operation and maintenance to the owner's representative.
   1. All demonstrations and training shall be video-taped by the Division 22 Plumbing Contractor. Two copies shall be turned over to the owner's representative.

3.06 COORDINATION DRAWINGS

A. Division 23 Mechanical contractor shall be responsible for creating Coordination drawings. Division 22 Plumbing contractor shall coordinate plumbing piping layout including plumbing mains, vent piping mains with Division 23 Mechanical contractor to include work on coordination drawings.
   1. All coordination drawings are to be created with a 3D modeling software that is compatible with Autodesk Navisworks.

3.07 MAINTENANCE AND OPERATING MANUALS AND INSTRUCTIONS

A. Comply with Section 01 7800 and the following:

B. Bind the written operating instructions, shop drawings, equipment catalog cuts, and manufacturer's instructions into the binder with each section separated by tabbed dividers. Material to be assembled as follows:
   1. First Page --Title of Job, Owner, Address, Date of submittal, Name of Contractor, and Name of Architect/Engineer. Emergency operating instructions and/or list of service organizations (including address and telephone numbers) capable of rendering emergency service on 24 hour calls.
   2. Second page--Index
   3. Sections--Each section shall include a subsection with a tab divider. The tab shall list the contents of the the divided section. There shall be a subsection that contains the following information:
      a. Written list of items requiring service and either state the service needed or refer to the manufacturer's data in the binder that described the proper service.

b. A copy of the approved shop drawing for all systems, equipment, and components (clearly marked for item furnished).
c. A copy of each manufacturer's operating instructions with an index at the beginning of the section.
d. A list of equipment used on the job, Contractor's purchase order numbers, supplier's name, and address.

4. Maintenance and operating manuals and instructions shall be also forwarded in electronic format via USB flash drive. Folders shall be created for each section and subfolder for each fixture and/or equipment required for the project.

3.08 RECORD DRAWINGS

A. The Contractor shall keep a running record of each change and deviation from the Drawings. Record shall be kept clean and undamaged upon a set of Drawings used for no other purpose. Upon completion of the Project, the Contractor shall submit to the Architect/Engineer one complete set of drawings which have been corrected to show deviations plus "Project Record Drawing" and the Contractor's letterhead type information. With the submittal shall be 2 sets of prints made from the corrected drawings.
1. CADD drawing option may be used by Contractor. Disks with specific Drawings are available from Architect/Engineer.

B. Record Drawings shall show:
1. Size, type, and capacity of materials, devices, or pieces of equipment.
2. Location of devices or pieces of equipment.
3. Routing of piping (above and below grade), or other building services.

C. These drawings shall also record the location of concealed piping by indication of measured dimensions to each such line from readily identifiable and accessible walls or corners of the building.

D. Record drawings must be complete and accurate with regard to concealed piping, like equipment, or devices. Unless record drawings are sufficiently accurate to permit immediate location and identification of concealed work with a minimum of cutting, record drawings will be considered inadequate and the contract work deemed incomplete.

END OF SECTION 22 05 01

SECTION 22 05 19
METERS AND GAGES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

1.02 RELATED REQUIREMENTS

A. Section 01 3329 - Sustainable Design Reporting

B. Section 22 1005 - Plumbing Piping

1.03 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi; 2004 (Reaffirmed 2017).

C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

E. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Manufacturers:
   1. Trerice.
   2. Ashcroft.
   3. Weiss.
   4. Dwyer Instruments, Inc: www.dwyer-inst.com.
   5. Moeller Instrument Company, Inc: www.moellerinstrument.com.
   6. Omega Engineering, Inc: www.omega.com.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Pressure Gauges: ASME B40.100, UL 393 drawn stainless steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch diameter.
   3. Mid-Scale Accuracy: One percent.
   4. Scale: Psi.
   5. Range: 0-100 psi.
   6. Gauges shall have 1/4 inch NPT bottom connection. Each gauge shall have a Trerice #735-2 or approved equal Brass Needle Valve 1/4 inch NPT for positive shut-off. #872-2

or approved equal Trerice Pressure Snubber 1/4 inch NPT must be installed wherever pulsation occurs.

2.02 GAS PRESSURE GAUGES

A. Manufacturers:
   1. Trerice.
   2. Ashcroft.
   3. Weiss.
   4. Dwyer Instruments, Inc: www.dwyer-inst.com.
   5. Moeller Instrument Company, Inc: www.moellerinstrument.com.
   6. Omega Engineering, Inc: www.omega.com.
   7. McMaster-Carr..
   8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Pressure Gauges: ASME B40.100, UL 393 drawn stainless steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 2-1/2 inch diameter.
   3. Mid-Scale Accuracy: One percent.
   4. Scale: inches of water column.
   5. Range: 0-30 inches of water column.
   6. Gauges shall have 1/4 inch NPT bottom connection. Each gauge shall have a Trerice #760 or approved equal Brass Needle Valve 1/4 inch NPT for positive shut-off. #872-1 or approved equal Trerice Pressure Snubber 1/4 inch NPT must be installed wherever pulsation occurs.

2.03 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Miljoco.
   2. Trerice.
   3. Ashcroft.
   4. Weiss.
   5. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
   6. Omega Engineering, Inc: www.omega.com/#sle.
   7. Weksler Glass Thermometer Corp: www.wekslerglass.com/#sle.
   8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thermometer: ASTM E 1, adjustable angle, red or blue appearing, non-toxic, spirit filled, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   3. Size: 9 inch scale.
   4. Window: Clear glass.
   5. Stem: 3/4 inch NPT brass.
   6. Accuracy: 2 percentper ASTM E77.
   7. Calibration: Degrees F.
   8. Range: 0-200 Degrees F.

2.04 DIAL THERMOMETERS

A. Manufacturers:

1. Miljoco.
2. Trerice.
3. Ashcroft.
4. Weiss.
5. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
6. Omega Engineering, Inc: www.omega.com/#sle.
7. Weksler Glass Thermometer Corp: www.wekslerglass.com/#sle.
8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
1. Size: 5 inch diameter dial.
2. Lens: Clear glass.
3. Size: 5 inch diameter dial.
4. Lens: Clear glass.
5. Accuracy: 1 percent.
6. Calibration: Degrees F.
7. Range: 0-200 Degrees F.

C. Thermometers - Adjustable Angle: Dial type bimetallic actuated; ASTM E1; stainless steel case, adjustable angle with front recalibration, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
1. Size: 5 inch diameter dial.
2. Size: 3 inch diameter dial.
3. Lens: Clear glass.
4. Accuracy: 1 percent.
5. Calibration: Degrees F.
6. Range: 0-200 Degrees F.

2.05 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

C. Provide instruments with scale ranges selected according to service with largest appropriate scale.

D. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

E. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

F. Locate test plugs adjacent thermometers and thermometer sockets.
1. Plumbing: Thermometers shall be installed with range up to 180 degrees at the following locations:
a. Domestic water heater inlet and outlet.

b. Domestic hot water storage tank outlet.
c. Domestic hot water thermostatic mixing valves inlet and outlet.

G. Locate test plugs and pressure gauges.
1. Plumbing: Pressure Gauges shall be installed with range up to 150 psi at the following locations:
a. At inlet and outlet of main Reduced Pressure Backflow Preventer.
b. At inlet to expansion tanks.
c. At outlet of circulating pumps.

END OF SECTION 22 05 19

SECTION 22 05 53
PLUMBING IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

1.02 RELATED REQUIREMENTS

A. Commissioning
   1. Section 01 9113 - General Commissioning Requirements
   2. Section 01 9114 - Commissioning Authority Responsibility

B. Section 09 91 23 - Interior Painting: Identification painting.

C. Section 22 1005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

B. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Seton Identification Products

B. Brady Corporation

C. Champion America, Inc

D. Brimar, Inc.

E. Kolbi Pipe Marker Co.

F. Marking Services Incorporated

G. Substitutions: See Section 01 6000 - Product Requirements.

2.02 NAMEPLATES

A. Description: Laminated three-layer plastic or aluminum with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.

2.03 TAGS

A. Metal Tags: Brass with Engraved letters; letters to be filled with black ink; tag size minimum 1-1/2 inch diameter with smooth edges.

B. Each valve shall have identifying letter(s) designating the system and an identifying sequential number designating the unit, such CW-# for cold water lines and HW-# for hot water lines. Identifying letters for piping systems shall be as follows:
   1. CW - Domestic Cold Water Supply
   2. HW - Domestic Hot Water Supply
   3. HWR - Domestic Hot Water Return
   4. NP - Non Potable Water
   5. NG - Natural Gas

C. Chart: Typewritten letter size list in anodized aluminum frame. Five copies (or sets) of valve tag charts of valves shall be furnished by each respective Contractor; said charts shall include the following items:
   1. Valve Identification
   2. Room Location (Owner Room Number)
   3. Room Location (Drawing Sheet Room Number)
   4. Purpose

D. Mount one set of valve tag charts in an anodized aluminum frame with plastic and secured on a wall in the mechanical room or as otherwise directed. Second set of charts to be prepared for "trouble shooting". The third, fourth, and fifth charts shall be bound into the operating and maintenance manuals.

2.04 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

E. Color code as follows:
   1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
   2. Fire Quenching Fluids: Red with white letters.
   3. Flammable Fluids (Gases): Yellow with black letters.
   4. Compressed Air: Blue with white letters.

2.05 CEILING TAGS

A. Description: 3/4 inch diameter colored, pressure-sensitive adhesive paper circles. Apply circles to ceiling grid below location of system equipment per following code.

B. Description: Steel with 3/4 inch diameter color coded head or 1/2 inch diameter colored, pressure-sensitive adhesive paper circles. Apply circles to ceiling grid below location of system equipment per following code.

C. Color code as follows:
   1. Plumbing Valves: Green.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers with lettering facing down to allow for identification from ground level.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Identify water heaters, hot water storage tank, and expansion tank with plastic nameplates or aluminum nameplates. Small devices, such as in-line pumps, may be identified with tags.

H. Identify valves in main and branch piping with tags.

I. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure (where applicable). Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

J. Provide ceiling tags to locate valves above T-bar type panel ceilings. Locate on ceiling grid below location of system equipment.

END OF SECTION 22 05 53

SECTION 22 07 17
PIPING SAFETY COVERS

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Piping Safety Covers.

2.02 RELATED REQUIREMENTS

A. Section 01 3329 - Sustainable Design Reporting

B. Section 22 07 19 - Plumbing Piping Insulation.

C. Section 22 10 05 - Plumbing Piping.

2.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.

B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2004.

C. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2003.

D. ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005.

E. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Underwriters Laboratories Inc.; 1996.

2.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for products specified in this section.

C. Shop Drawings: Indicate locations and configurations of piping insulation for indicated plumbing configurations.

D. Manufacturer's printed installation instructions for each specified product.

2.05 DELIVERY, STORAGE, AND HANDLING

A. Store products of this section in manufacturer's unopened packaging until installation; maintain storage conditions for products in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

3.01 MANUFACTURERS

A. Truebro, Inc.

B. Dearborn Safety Series

C. McGuire Manufacturing, Inc.

D. Plumberex

E. Keeney Manufacturing Co.

F. Proflo.

G. Zurn.

H. Mainline

I. Substitutions: See Section 01 60 00 - Product Requirements.

3.02 PIPING INSULATION ACCESSORIES

A. Provide products that comply with the following:
   1. Americans With Disabilities Act (ADA), Article 4.19.4.
   2. ANSI/ICC A117.1, American National Standard for Accessible Buildings and Facilities.
   3. BOCA Basic Building Code.
   4. Requirements of applicable building code.

B. Piping Safety Covers:
   1. Characteristics: Three-piece molded assembly, minimum 1/8 inch wall thickness, with internal ribs to provide air space between piping and piping insulation jacket, molded to receive manufacturer's snap-clip fasteners.
   2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell anti-microbial vinyl compound, UV-stable, non-fading, non yellowing; having the following performance characteristics:
      a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.
      b. Thermal Conductivity: K-value 1.17, when tested in accordance with ASTM C 177.
      c. Indentation Hardness: 60, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.
   3. Trap Assembly Cover: Three-piece assembly, with removable clean-out nut enclosure.
   4. Angle Stop Covers: Formed with hinged cap for access to valve without requiring cover removal.
   5. Configurations: In accordance with manufacturer's product data for project piping configurations indicated on drawings.
   6. Color: China White, gloss finish; paintable.
   7. Fasteners: Manufacturer's standard re-usable snap-clip fasteners; wire-tie fasteners not permitted.

PART 3 EXECUTION

4.01 EXAMINATION

A. Verify that piping configurations are correct type for piping cover component configurations specified.

4.02 INSTALLATION

A. Install products of this section in accordance with manufacturer's printed installation instructions.

4.03 PROTECTION OF INSTALLED PRODUCTS

A. Do not allow damage to installed products by subsequent construction activities; protect products until Substantial Completion.

END OF SECTION 22 07 17

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

A. Commissioning
   1. Section 01 9113 - General Commissioning Requirements
   2. Section 01 9114 - Commissioning Authority Responsibility

B. Section 07 84 00 - Firestopping.

C. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

A. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020.

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2019.

D. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2017, with Editorial Revision (2018).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

F. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

H. ASHRAE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product property performance, and thickness.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, or NFPA 255.

B. All mastics, sealants, adhesives and etc. used for interior insulation installation shall meet voc limits as defined by LEED.

2.02 GLASS FIBER

A. Manufacturers:
   1. Johns Manville Corporation; _____: www.jm.com/#sle.
   2. Knauf Fiber Glass
   3. Owens Corning Corp
   4. Manson
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C547 ; rigid molded, noncombustible, end grain adhered to jacket.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum moisture absorption: 5 percent by weight.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. All joints to be sealed with factory-applied, self-seal lap and butt strips.

2.03 FLEXIBLE ELASTOMERIC FOAM INSULATION

A. Manufacturers:
   1. Aeroflex USA, Inc; Aerocell
   2. Armacell LLC
   3. K-Flex USA LLC
   4. Nomaco.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation material shall be an EPDM rubber, flexible, closed-cell elastomeric insulation in tubular or sheet form. The product will be tested for and meet or exceed the requirements defined in ASTM C 534.

C. EPDM elastomeric insulation material shall be manufactured without the use of CFC's, HFC's or HCFC's.

D. EPDM elastomeric insulation shall have a flame-spread index of 25 or less and a smoke-developed index of 50 or less when tested in accordance with ASTM E 84, for all products through 2" thickness. Product to be suitable for use from -297F to 300F continuous service temperature, per ASTM C 411.

E. EPDM elastomeric insulation shall have a maximum thermal conductivity of 0.245 Btu-in./h-ft2 F at a 75 F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518.

F. EPDM elastomeric insulation shall have a maximum water vapor transmission of 0.03 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision.

G. Product must exhibit long-term UV resistance, when unfinished in outdoor installations, per ASTM G 7 and ASTM G 90.

H. EPDM elastomeric insulation must not contribute to external stress corrosion cracking as when tested by ASTM C 692.

I. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation. Accessories and adhesives shall not detract from any of the system ratings as specified above.

2.04 JACKETS

A. PVC Plastic.
   1. Manufacturers:
      a. Knauf
      b. Owens Corning Corp
      c. Johns Manville International, Inc
      d. Certainteed Corp
      e. Zeston 2000
      f. PROTO PVC Corp.
      g. VentureClad
      h. Speedline Corp.
      i. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil.
      e. Connections: Brush on welding adhesive.

B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
   1. Thickness: 0.016 inch sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with the Midwest Insulation Contractors Association (MICA), National Commercial and Insulation Standard.

C. All insulation shall be applied so that there is no fiberglass exposed to the return air plenum. All fiberglass insulation, including all exposed edges, shall be coated, or mylar or other suitable material shall be provided between fiberglass and the air stream.

D. Exposed Piping: Locate insulation and cover seams in least visible locations.

E. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

F. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive, Hi/Low Temp Inserts, and PVC fitting covers.

G. Glass fiber insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Inserts and Shields:
1. Application: Piping 1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert Location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 5 feet above finished floor): Finish with PVC jacket and fitting covers.

K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with PVC or aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

A. Plumbing Systems:
1. Domestic Hot Water Supply:
a. Glass Fiber Insulation:
1) Pipe Size Range: 1 1/4 inch and less:
(a) Thickness: 1 inch.
2) Pipe Size Range: 1 1/2 inch and above:
(a) 1 1/2 inch.
b. Flexible Elastomeric Foam Insulation:
1) Pipe Size Range: 1 1/4 inch and below:
(a) Thickness: 1/2 inch.
2) Pipe Size Range 1 1/2 inch and above:
(a) Thickness: 1 inch.
2. Domestic Hot Water Recirculation:
a. Glass Fiber Insulation:
1) Pipe Size Range: 1 1/4 inch or below:
(a) Thickness: 1 inch.
2) Pipe Size Range: 1 1/2 inch or above:
(a) Thickness: 1 1/2 inch
b. Flexible Elastomeric Foam Insulation:

1) Pipe Size Range: 1 1/4 inch and below:
(a) Thickness: 1/2 inch.
2) Pipe Size Range: 1 1/2 inch and above:
(a) Thickness: 1 inch

3. Domestic Cold Water:
a. Glass Fiber Insulation:
1) Pipe Size Range: All sizes.
(a) Thickness: 1 inch.
b. Flexible Elastomeric Foam Insulation:
1) Pipe Size Range: 1 1/4 inch and below:
(a) Thickness: 1/2 inch.
2) Pipe Size Range: 1 1/2 inch and above
(a) Thickness: 1 inch

4. Sanitary Above Grade serving mechanical mezzanine floor drains.
a. Glass Fiber Insulation:
1) Pipe Size Range: All sizes.
(a) Thickness: 1/2 inch.
b. Flexible Elastomeric Foam Insulation:
1) Pipe Size Range: All sizes.
(a) Thickness: 1/2 inch.

5. Roof Drain Bodies:
a. Flexible Elastomeric Foam Insulation:
1) Pipe Size Range: All sizes.
(a) Thickness: 1 inch.

6. Roof Drainage Above Grade:
a. Glass Fiber Insulation:
1) Pipe Size Range: All sizes.
(a) Thickness: 1 inch.
b. Flexible Elastomeric Foam Insulation:
1) Pipe Size Range: All sizes.
(a) Thickness: 1 inch.

END OF SECTION 22 07 19

SECTION 22 08 00
PLUMBING COMMISSIONING

PART 1 - GENERAL

1.01 SUMMARY

A. The Owner has contracted separately with a Commissioning Authority independent from the Architect, Engineer, and Contractors. The Commissioning Authority shall be responsible solely to the Owner and shall act as an agent of the Owner in the quality control of the project. The Commissioning Authority shall, through the Owner, have the authority to direct the Contractors to perform corrective work until final acceptance of the project by the Owner.

B. The purpose of the commissioning is to verify for the Owner that building systems have been designed and installed to meet the Owner's Project Requirements and operate per the design intent. Commissioning does not eliminate or reduce the responsibility of the design team or contractors to provide a complete and functional facility but is rather to ensure an effective transition from the construction team to the Owner.

C. Specifications have been included to define contractors' responsibilities. It is expected that each contractor participates in the commissioning process, and it is the responsibility of each contractor to provide adequate personnel to do so

1.02 RELATED DOCUMENTS

A. Section 01 91 13 – General Requirements – Commissioning

1.03 PLUMBING SYSTEMS / EQUIPMENT COMMISSIONED

A. Domestic Hot Water Heaters
B. Domestic Hot Water Circulating Pumps
C. Domestic Hot Water Mixing Valves and Controls
D. Water Meters

PART 2 - COMMISSIONING PROCESS

2.01 PRE-FUNCTIONAL TESTING / MANUFACTURER'S STARTUP CHECKLIST

A. The Commissioning Authority will provide pre-functional checklists. The installing contractor will complete the Pre-Functional Checklists and Manufacturer's Start-Up Checklists for each piece of equipment prior to functional testing.

B. Start-up of major plumbing systems may be witnessed by the Commissioning Authority. The contractor shall provide the Commissioning Authority a minimum of 72 hours' notice prior to equipment start-up. The appropriate contractors and/or manufacturer's representative will be required on site to perform start-up. Start-up will be performed according to the Manufacturer's recommended procedures.

C. The equipment manufacturers' start-up report shall be completed and provided to the Commissioning Authority

2.02 FUNCTIONAL TESTING

A. The Commissioning Authority will perform or witness the installing contractor or manufacturer's representative performing Functional Testing.

B. Each major system will be tested, and a random sample of each subsystem will be tested.

2.03 MASTER ISSUES LOG

A. Deficiencies noted during the commissioning process shall be documented in the Master Issues Log.

B. Contractors will be responsible for correcting deficiencies and providing written responses to the Commissioning Authority describing the date and method of resolution. If the deficiency was not corrected, the contractor shall provide an explanation as to why it was not corrected.

C. Participation in the in the commissioning process is the contractors' responsibility. Unresolved issues or a failure to provide responses to the Master Issues Log may be considered during the pay application approval process.

D. Status will be tracked for each deficiency and the Master Issues Log will be updated accordingly.

E. The Commissioning Authority will perform limited rechecks of discrepancies after written notification has been received from the contractor that corrections are complete. The cost of subsequent rechecks, if necessary, will be charged directly to the contractor at the hourly rate of the Commissioning Authority.

PART 3 - EXECUTION

3.01 RESPONSIBILITIES OF PLUMBING SYSTEMS INSTALLER

A. The Contractor shall provide the Commissioning Authority assistance as necessary to gain access to the construction site for the purpose of verifying that the installation of materials and equipment is performed in accordance with the contract documents. This shall include the use of keys, ladders, power lifts and other specialized equipment where necessary.

B. Assure participation of major equipment manufacturers in appropriate startup, training, and testing activities.

C. Participate in commissioning specific meetings scheduled by the Commissioning Authority or Construction Manager.

D. Complete pre-functional checklist for Commissioning Authority review.

E. Assist the Commissioning Authority as necessary during functional testing.

F. Provide owner training per the project specifications.

G. It is the specific responsibility of each contractor to complete all equipment setup, testing, calibration, loop tuning, and related functions prior to Commissioning. The Contractor shall complete all required checklists and certify in writing that these tasks have been accomplished and that the systems are ready for commissioning.

END OF SECTION

SECTION 22 08 00
COMMISSIONING OF PLUMBING

PART 1 GENERAL

1.01 OWNER FURNISHED

A. See Section 01 9113 – General Commissioning Requirements

1.02 RELATED DOCUMENTS

A. All drawings and general provisions of the contract, including all other Division 01 and general and supplementary conditions.

B. Section 01 9113 – General Commissioning Requirements

1.03 SUMMARY

A. The purpose of the commissioning process is to provide the owner/operator of the facility with a high level of assurance that the domestic hot water systems have been installed in the prescribed manner, and operate within the performance guidelines set in the Contract Documents. The Commissioning Authority (CA) shall provide the owner with an unbiased, objective view of the system's installation, operation, and performance. This process is not intended to take away or reduce the responsibility of the design team or installing contractors to provide a finished product. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems for beneficial use by the owner. The CA will be a member of the construction team, administrating and coordinating commissioning activities with the design team, construction manager, subcontractors, manufacturers and equipment suppliers.

1.04 REFERENCES

A. See Section 01 9113 – General Commissioning Requirements

1.05 SCOPE

A. See Section 01 9113 – General Commissioning Requirements

1.06 DOMESTIC HOT WATER SYSTEMS / EQUIPMENT, IF INSTALLED, INCLUDED IN THE COMMISSIONING PROCESS

A. Domestic Hot Water Tanks

B. Domestic Hot Water Pumps

C. Domestic Hot Water Valves and Piping

1.07 P2 COMMISSIONING PLAN

1.08 COMMISSIONING PLAN DOCUMENT

A. See Section 01 9113 – General Commissioning Requirements

1.09 COMMISSIONING TEAM

A. See Section 01 9113 – General Commissioning Requirements

1.10 CONTRACT DOCUMENT

A. See Section 01 9113 – General Commissioning Requirements

1.11 COMMISSIONING MEETINGS

A. See Section 01 9113 – General Commissioning Requirements

1.12 MASTER FINDINGS LIST

A. The Commissioning Authority (CxA) or installing contractor will complete Pre-Functional Testing. Commissioning Agent conducts Functional Testing with assistance of installing contractor.

B. All findings from these inspections are documented and are posted to the master findings list and website within two business days.

C. The Construction Manager (CM) will regularly distribute findings list to contractors and will hold contractor accountable to: 1.) correct any items and/or 2.) provide electronic responses for each finding.

D. The responsible contractor will correct finding(s) and provide written confirmation that the finding(s) have/has been corrected. If finding was not corrected, contractor provides written explanation.

E. Commissioning findings' status may be considered during the pay application approval process. Approval may be withheld due to unresolved findings and/or findings where written responses have not been provided.

F. The CM provides responses back to CxA. All responses are updated to the Master Findings List.

G. Once written responses are provided for each finding, the CxA will re-inspect. The contractor will be back-charged at a rate not to exceed the CxA contract hourly rate for any finding(s) that was/were reported to have been resolved and that are found to be unresolved upon re-inspection.

H. Status will be tracked for each finding and the Master Findings List will be updated accordingly.

I. Once all findings have been resolved and the job is completed, a Final Report will be generated and a final commissioning meeting will be held.

1.13 PRE-FUNCTIONAL TESTING / MANUFACTURER'S CHECKLISTS

A. The Commissioning Authority (CxA) or installing contractor will complete the Pre-Functional Testing forms for each piece of equipment prior to start-up.

B. The equipment manufacturers' checklists must be completed by the installing contractor and reviewed by the Commissioning Authority before start-up can commence.

1.14 START-UP

A. Start-up of major Domestic Hot Water systems may be witnessed by the Commissioning Authority. The appropriate contractors and/or manufacturer's representative will be required on site to perform start-up. No system will be started until the appropriate Start-up Verification Checklists (SVC's) have been completed. No system will be started until the Manufacturer's checklists have been completed. Start-up will be performed according to the Manufacturer's recommended procedures. The Commissioning Authority will visit the site to review completeness of installation in conjunction with progress meetings prior to starting domestic hot water equipment.

B. Installing contractors involved in installation, fabrication, manufacture, control, or design of equipment are required to be present at the time of start-up. A factory-authorized technician will be on site to start equipment when required by the specifications. This will minimize delays in bringing equipment on line and expedite acceptable functional performance in accordance with the Design Intent documents.

1.15 FUNCTIONAL TESTING

A. The Commissioning Authority will perform or witness installing contractor, or manufacturer's representative performing Functional Testing based on the Owner's Project Requirements

(OPR) and the Basis of Design (BOD). These tests will be completed for domestic hot water systems and subsystems.

B. Each major system will be tested. A random sample of each subsystem will be tested. This may be coordinated and witnessed by the Commissioning Authority and the owner's maintenance staff. Witnessing the Functional Tests will serve as a compliment to the Operation and maintenance training. No Functional Tests will be performed until the TAB report and the control contractor Point Installation Verification Checklists have been submitted and reviewed by the Commissioning Authority.

C. Off-season mode testing will be implemented as necessary to assure conformance with the Basis of Design document (BOD). Installing contractors will be expected to participate as required by the project specifications.

1.16 BUILDING TURN-OVER / OWNER ORIENTATION / USER TRAINING

A. Owner training will be provided by the installing contractor, or manufacturer's representative, and may be witnessed by the Commissioning Authority. This training should include both classroom training and hands-on operational training. The owner may choose to videotape this training for future use. The Commissioning Authority may visit the site during the Turn-Over and Training period to assure that any on-going Domestic Hot Water System related problems are being addressed and corrected in a timely and efficient manner.

B. The Commissioning Authority will assist in the coordination of off-season testing, calibrating, and servicing as specified in the contract documents.

1.17 WARRANTY REVIEW

A. The Commissioning Authority will participate in a 10-month walk-through to observe the operation of the domestic hot water system. This will include a review meeting with installer, a discussion of warranty issues, energy usage, maintenance practices, usage changes, and chronic problems, as well as other issues affecting the owner and the operation of the domestic hot water systems.

END OF SECTION 22 0800 22 08 00

SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, specialties, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Storm water.
   4. Natural Gas.
   5. Flanges, unions, and couplings.
   6. Pipe hangers and supports.
   7. Valves.
   8. Check.
   9. Relief valves.
   10. Strainers.

B. Testing and Repair

C. Disinfection of Domestic Water Piping System

D. Service Connections

1.02 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation.

B. Section 31 23 23 - Fill.

C. Section 31 23 16.13 - Trenching.

D. Section 33 13 00 - Disinfecting of Water Utility Distribution.

E. Section 07 84 00 - Firestopping.

F. Section 08 31 00 - Access Doors and Panels.

G. Section 09 91 23 - Interior Painting.

H. Section 22 05 53 - Plumbing Identification.

I. Section 22 07 19 - Plumbing Piping Insulation.

J. Section 31 23 16 - Excavation.

K. Section 33 01 10.58 - DISINFECTION OF WATER DISTRIBUTION.

1.03 REFERENCE STANDARDS

A. AGA/ANSI B109 Set - INCLUDES ANSI B109.1, ANSI B109.2, ANSI B109.3, ANSI B109.4; 2000.

B. ANSI Z223.1 - National Fuel Gas Code; 2021.

C. AGA/ANSI B109 Set - Gas displacement meters and service regulators.

D. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers; 1968.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2019.

G. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fuzing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.

H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

I. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

K. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

L. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.

M. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

N. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).

O. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; 2001 (Reapproved 2014).

P. AWWA C651 - Disinfecting Water Mains; 2014.

Q. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2017 (Revised 2018).

R. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

S. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

T. NSF 372 - Drinking Water System Components - Lead Content; 2022.

U. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

V. ANSI/ASME Section 9, AWS D10.9 and D1.1 National Certified Pipe Welding Bureau.

W. ANSI B16.18 - Soldering Procedures.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Project Record Documents: Record actual locations of valves and pipe routings above ceiling and below floor.

1.05 QUALITY ASSURANCE

A. Maintain one copy of drawings on project site to mark pipe routings and valve locations.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

F. All piping shall be American made and shall comply with the Buy American Provision of the ARRA.

1.06 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of Ohio plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.08 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 SANITARY SEWER AND VENT PIPING

A. Cast Iron Pipe: CISPI 310, hubless. Piping shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.
   1. Fittings: Cast iron Hubless, CISPI 310
   2. Joints: CISPI 310, ASTM D 1247 Standard Duty, neoprene gasket and stainless steel clamp and shield assemblies.

B. PVC Pipe: Schedule 40 solid wall, ASTM D1785, ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.
   3. Joints: No Hub, CISPI-310 compression type with ASTM C 564 neoprene gaskets and stainless steel clamp and shield assembly.

C. Sanitary and vent piping in return air plenums, chases exposed to plenums and through fire walls shall be cast iron no hub and no hub fittings. ABS, CPVC and PVC piping will not be allowed in any of the spaces noted.

D. PVC, CPVC and ABS piping shall only be used in under ground applications. All plumbing chases shall be cast iron unless completely sealed off to the plenum space.

2.02 DOMESTIC WATER PIPING

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze. All fittings shall be lead free and conform to NSF-61-G.
   2. Joints: ASTM B32, alloy Sn95 solder.
   3. Joints: Grooved Pipe. Fittings to conform to ASTM B75 or ASTM B-152.
   4. Joints: Copper press fittings. Fittings to conform to ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze. All fittings shall be lead free and conform to NSF-61-G.
   5. Solders and flux: ASTM B828, ASTM B813, containing 0.2% lead or less.

B. Grooved Pipe:

1. Manufacturers:
    a. Victaulic, Style 607 "Quick Vic"
    b. Tyco/Grinnell; Style 672
    c. Anvil/Gruvlok; Style 6400
    d. Apollo- Shurjoint; Style C305
    e. Substitutions: Not Permitted.
2. Couplings 2 inches thru 8 inches shall be installation ready wrought copper fittings conforming to ASTM B75/B75M or ASTM B-152, angle-pattern bolt pads to provide rigidity, complete with a pressure responsive synthetic rubber Grade "P" Fluoroelastomer compound gasket with red and blue color code, rated from 0 degrees F to +180 degrees F, with plated nuts and bolts to secure unit together.
3. If rigid couplings are provided by Tyco Grinnell or Anvil Gruvlok, bolt pads must have equal gaps on each side and a torque wrench must be used to attain the manufacturer's documented torque rating, this will be verified by the engineer's field representative.
4. Gaskets by Anvil Gruvlok, in copper applications, must be lubricated (inside and out) with Gruvlok Xtreme Lubricant.
5. Option to fittings used for tees and outlets in grooved piping systems may be mechanical tee type consisting of a cast bronze upper housing with female NPT threaded outlet and locating collar, ductile iron lower housing coated with copper-colored enamel and synthetic rubber gasket.
6. All grooved end couplings and fittings shall be tested and certified to conform to ASTM F1476-93. Grooves must be rolled and must meet ANSI/AWWA C606.
7. The use of mechanical couplings may not be utilized as a means of expansion regardless of manufacturer.
8. Flaring of tube and fitting ends to IPS dimensions will not be allowed.

C. Copper Press Fittings:
1. Material:
    a. Press Fittings: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM. All fittings shall be lead free and conform to NSF-61-G.
2. Installation: Copper press fittings shall be made in accordance with the manufacturers installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fittings alignment shall be checked against the mark on the tubing to assure the tubing is fully inserted into the fitting. The joints shall be pressed using the tool approved by the manufacturer.

D. Polypropylene:
1. Manufacturers:
    a. Aquatherm
    b. Nupi Americas - Niron
    c. Substitutions: See Section 01 6000 - Product Requirements
2. Pipe shall be manufactured from a PP-R or PP-RCT resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The pipe shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipe shall be made in a three layer extrusion process. Domestic hot water shall contain a fiber layer (faser) to restrict thermal expansion. All pipe shall comply with the rated pressure requirements of ASTM F 2389. All pipe shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11. 2. Aboveground: Polypropylene (PP-R or PP-RCT) piping in SDR 6, 7.4 or 11 based on the required minimum pressure rating and use temperature.

3. Fittings: Fittings shall be manufactured from a PP-R or PP-RCT resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The fittings shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All fittings shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.
4. Valves: Valves shall be manufactured in accordance with the manufacturers specifications and shall comply with the performance requirements of ASTM F 2389 or CSA B137.11. The valves shall contain no rework or recycled thermoplastic materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.
5. Smoke and Fire Ratings:
    a. Where indicated on the drawings that a Plenum-rated Piping System is needed, then the pipe shall be pre-insulated or field insulated, and when tested with standard un-insulated fittings per CAN/ULC-S102.2-03 or ASTM E84, the system consisting of wrapped or coated pipe and bare fittings shall have a Flame Spread Classification of less than 25 and Smoke Development rating of less than 50.
6. Joints:
    a. Install fittings and joints using socket-fusion, electrofusion, or butt-fusion as applicable for the fitting type. All fusion-well joints shall be made in accordance with the pipe and fitting manufacturer's specifications and product standards.
    b. Fusion-weld tooling, welding machines, and electrofusion devices shall be as specified by the pipe and fittings manufacturer.
    c. Prior to joining, the pipe and fittings shall be prepared in accordance with F 2389 and the manufacturer's specifications.
    d. Joint preparation, setting and alignment, fusion process, cooling times and working pressure shall be in accordance with the pipe and fitting manufacturer's specifications.
7. Pipe Insulation:
    a. Where insulation is indicated on the drawings or in these specifications, Aquatherm Advanced pipe with thermal (radiant, conductive, and convective) and vapor barrier insulation shall be provided. The thick wall, self insulating fittings do not require an additional vapor barrier for the piping system to meet this performance level. The thermal barrier is UV resistant, CFC-free, non-porous, non-fibrous, and resist mold growth. The pipe with the integral thermal barrier with standard unprotected fittings shall meet the ASTM E84 and the CAN/ULC S102.2 requirements for a Flame Spread Rating of 25 and Smoke Development rating of 50.

E. Cross linked polyethylene / PEX
1. Manufacturers:
    a. Uponor
    b. Zurn
    c. Viega
    d. Watts
    e. Nibco
    f. Rahau
    g. Substitutions: See Section 01 6000 - Product Requirements
2. Pipe:
    a. Cross-linked polyethylene (PEX) manufactured by the PEX-A (Engel Method), PEX-B (Silane Method), or PEX-C (Electron Beam Method).
    b. Non Barrier Type

1) Shall have a pressure and temperature rating of 160 psi at 73 degrees F, 100 PSI at 180 degrees F, and 80 PSI at 200 degrees F.
2) Tubing shall have a minimum of 6 months UV protection.

c. Manufacture in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent third-party agency.
d. Minimum bend radius shall be no less than 6 times the outside diameter.

3. Fittings:
   a. Crimp or Clamp Style with barb fittings. Manufacture in accordance with ASTM F1807 or ASTM F2159 and/or comply with ASTM F877 system standard as identified on the fitting. Fittings to be constructed of brass or EP. Copper crimp ring, stainless steel crimp ring, and stainless steel clamps shall be listed to ASTM F1807 and/or ASTM F877. Use for PEX-B or PEX-C tubing only.
   b. Expansion Fitting: Manufacture in accordance with ASTM F1960. Fittings to be constructed of brass or EP. Use for PEX-A tubing only.
4. Tools:
   a. All tools and fittings shall be provided or approved for use by the PEX tubing manufacturer.
5. Manifold:
   a. QuickPort Preassembled
   b. Copper Manifold System
   c. CR Manifold
   d. Multiport fittings
   e. Copper Header
6. Valves:
   a. Shall be of the metal type with barbed fittings for connection to PEX tubing. Shall meet the requirements of ASTM F877. See additional requirements below.

2.03 STORM WATER PIPING

A. Cast Iron Pipe: ASTM A 74 extra heavy weight. Piping shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

C. Storm piping in return air plenums, chases exposed to plenums and through fire walls shall be cast iron. PVC piping will not be allowed in any of the spaces noted.

D. PVC piping shall only be used in under ground applications. All plumbing chases shall be cast iron unless completely sealed off to the plenum space.

2.04 NATURAL GAS PIPING

A. Polyethylene Pipe: ASTM D 2513, SDR 11.
   1. Fittings: ASTM D 2683 or ASTM D 2513 socket type.
   2. Joints: Fusion welded.
   3. Polyethylene pipe shall only be used for buried piping. Install per gas company requirements. Provide a tracer wire.

B. Steel Pipe: ASTM A 53/A 53M Schedule 40 black. Piping smaller than 1/2 inch NPS will not be allowed.
   1. Pipe size 2" and above: Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M , wrought steel welding type.

2. Joints and fittings: For pipe sizes 4" and under, cold press mechanical joint fitting shall conform to material requirements of ASTM A420 or ASME B16.3 and performance criteria of IAPMO PS117. Sealing elements for press fittings shall be HBNR. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer.
    a. Approved Manufacturers
        1) JOINTSViega: MegaPress
        2) Apollo: PowerPress
        3) Mueller Streamline Co.: STL-G
        4) Substitutions: See Section 01 60 00 - Product Requirements.
3. Pipe size 1-1/2" and below: Joints: NFPA 54, threaded or welded to ASME B31.1.

C. Arc-Resistant CSST Pipe: Sizes 1/2"-1-1/4" ANSI Z223.1, Type 304 stainless steel ASTM A240/A240M-95A, with Black UV /Ozone/ Arc-Resistant Polyethylene
1. Fittings: ASTM B16, ASME B1.20.1
2. Pipe shall only be used in utility trenches for the science rooms if applicable.
3. Max pressure = 25 psi, Max test pressure = 150 psi

D. Double Wall Containment Pipe:
1. Carrier Pipe: ASTM A 53/A Steel
2. Inner Pipe supports: To be non-metallic supports every 10'-0" or less to allow free air and fluid movement within the containment pipe.
3. Outer Containment Pipe: ASTM 1785 schedule 40 PVC or 10 gauge steel casing.
4. Fittings: shall match both the carrier piping system and the outer containment piping systems as needed.
5. To be used in underground applications as needed. Vent outer containment piping to exterior with gooseneck vent and insect screen.

E. Provide 1/2 inch elastomeric insulation around all gas piping in walls and through floors.

F. All gas piping shall be accessible.

2.05 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:
1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings:
1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
2. Sealing gasket: "C" shape composition sealing gasket.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.06 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - Drain, Waste, Storm, and Vent:
1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable swivel, clevis.

4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Plumbing Piping - Water, Gas, Compressed Air:
1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable swivel, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Structural Supports shall be beam clamps, sloped beam clamps, or strap in strut mount hangers.
    a. Arrange all mechanical supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.
    b. If support must occur between panel joints, then threaded rods shall be dropped from both panel points, an adequate angle to both, and then the support attached to the angle is required.
    c. Unless specifically indicated or approved by Garmann Miller & Associates Inc. do not provide support from roof decks or floor decks.
8. Vertical Support: Steel riser clamp.
9. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
10. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
12. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
    a. Bases: High density polypropylene or UV resistant rubber.
    b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
    c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
    d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
    e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

C. Copper tubing 1/2 inch to 2 inch: When attached directly to copper piping or tubing, hangers shall be equipped with permanently attached factory liner of high compression factor, chemically treated to resist moisture, abrasion, heat, cold and vermin. Liner shall be felt or equally approvable material, or hangers shall be copper plated. Lined or plated hangers not required when hanger is oversized to cover an insulated line.

D. Pex Piping 1/2 inch to 3 inch: When suspended piping applications with hangers or unistrut shall have pipe supports installed to provide similar pipe mounting spacing to copper piping. Pipe supports shall be equal to Uponor model: PEX-a Pipe Support, 9 foot length.

2.07 GLOBE VALVES

A. Manufacturers:
   1. Conbraco Industries / Apollo Valves.
   2. Nibco, Inc.
   3. Crane Co. - Valve Division.
   4. Hammond.
   5. Watts.
   6. Milwaukee Valve Company.
   7. Kitz.
   8. Red-White Valve Corp.
   9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up To and Including 2 Inches
   1. Valves shall be Class 150 and manufactured in accordance with MSS SP 80; body and bonnet are to be of bronze ASTM B-62. Stems shall be of dezincification-resistant silicone bronze ASTM B-371 or low zinc alloy B-99, non asbestos packing, TFE seat disc and malleable or ductile iron handwheel. Where higher operating pressures approach 150 PSI, Class 150 union bonnet valves of like construction will be used. Valve ends may be threaded or solder type.

C. 2-1/2 Inches and Larger
   1. Valves to be Class 125 manufactured in accordance to MSS SP 85, flanged, bolted bonnet, OS&Y, iron body, bronze trimmed, with body and bonnet conforming to ASTM A-126 class B cast iron. Packing and gaskets to be non-asbestos. Provide chain wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.08 BALL VALVES

A. Manufacturers:
   1. Apollo Valves; _____: www.apollovalves.com/#sle.
   2. Conbraco Industries / Apollo Valves.
   3. Crane Co. - Valve Division.
   4. Hammond.
   5. Watts.
   6. Milwaukee Valve Company.
   7. Jomar Valve
   8. Kitz.
   9. Red-White Valve Corp.
   10. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

C. Valves shall be rated 150 psi CWP and 600 psi non-shock WOG and will have 2 piece cast bronze lead free bodies conforming to NSF-61-G and ISO 6509, TFE seats, full port, separate packnut with adjustable stem packing, anti-blowout stems and chrome plated bronze ball. Valve ends shall have full depth ANSI threads or extended solder connections and be manufactured to comply with MSS SP-110.

1. Valves shall have a permanent marking on valve body identifying valve as lead free in conformance with NSF-61-G.

D. Valve handles shall be lever type, metal handle with epoxy coated finish. Plastic handles will not be approved.
   1. Where piping is insulated, ball valves shall be equipped with 2" extended handles of non-thermal conductive material. Also provide a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Memory stops, which are fully adjustable after insulation is applied, shall be included.

2.09 PLUG VALVES

A. Manufacturers:
   1. Conbraco Industries / Apollo Valves.
   2. Crane Co. - Valve Division.
   3. Hammond.
   4. Watts.
   5. Milwaukee Valve Company.
   6. Kitz.
   7. Homestead
   8. Nordstrom
   9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction 2-1/2 Inches and Larger: ANSI B16.1, 175 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.10 BUTTERFLY VALVES

A. Manufacturers:
   1. Apollo Valves; _____: www.apollovalves.com/#sle.
   2. Victaulic
   3. Conbraco Industries / Apollo Valves.
   4. Hammond Valve.
   5. Crane Valve.
   6. Watts.
   7. Milwaukee Valve Company.
   8. Jomar Valve
   9. Kitz.
   10. Red-White Valve Corp.
   11. Substitutions: See Section 01 60 00 - Product Requirements.

B. Valves shall be lug of I.P.S. grooved body style manufactured in accordance with MSS SP-67 rated at least 200 psi non-shock cold water working pressure. Body to have 2 inch extended neck for insulating and to be cast iron or ductile iron. Valve to have aluminum bronze alloy disc with EPDM rubber seat and seals; or EPDM rubber encapsulated disc with polymer coated body. Stem shall be 400 series stainless steel and shall not have exposed stem to disc fasteners. Sizes 2 inch - 6 inch shall be lever operated with 10 position throttling plate; sizes 8 inch and larger shall have gear operators. Lug style and grooved style shall be capable for use as isolation valves and recommended by the manufacturer for dead-end service at full pressure without the need for downstream flanges.

2.11 SWING CHECK VALVES

A. Manufacturers:
   1. Hammond Valve.

2. Conbraco Industries / Apollo Valves.
3. Crane Co. - Valve Division.
4. Watts.
5. Milwaukee Valve Company.
6. Jomar Valve
7. Kitz.
8. Red-White Valve Corp.
9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up to 2 Inches:
1. Valves shall be Y-Pattern swing-type manufactured in accordance with MSS SP-80 Class 150, bronze ASTM B-62 lead free or DZR brass bodies conforming to NSF-61-G with TFE seat disc. Where higher operating pressures approach 150 psi, Class 150 valves of like construction shall be used. Valve ends may be threaded or solder type.

C. Over 2 Inches:
1. For horizontal lines shall be swing-type manufactured in accordance with MSS SP-71 Class 125, flanged, ASTM A-126 Class B, cast iron body with bronze trim, non-asbestos gasket. For vertical lines or pump discharge, valves shall be wafer or lug style, in line, spring actuated lift check manufactured in accordance with MSS SP-126. Body shall be cast iron ASTM A-126, Class B with stainless steel spring, bronze disc plates, rubber seat

2.12 SPRING LOADED CHECK VALVES

A. Manufacturers:
1. Hammond Valve.
2. Conbraco Industries / Apollo Valves.
3. Crane Valve.
4. Watts.
5. Milwaukee Valve Company.
6. Kitz.
7. Red-White Valve Corp.
8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Class 125, iron body, bronze lead free trim conforming to NSF-61-G , stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.13 RELIEF VALVES

A. Pressure Relief:
1. Manufacturers:
a. Cla-Val Co
b. Henry Technologies
c. Watts Regulator Company
d. Conbraco Industries / Apollo Valves
e. Caleffi
f. Substitutions: See Section 01 60 00 - Product Requirements.
2. ANSI Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:
1. Manufacturers:
a. Cla-Val Co
b. Henry Technologies
c. Watts Regulator Company

d. Conbraco Industries / Apollo Valves
e. Caleffi
f. Substitutions: See Section 01 60 00 - Product Requirements.

2. ANSI Z21.22 certified, bronze lead free body conforming to NSF-61-G, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

C. Vacuum Relief:

1. Manufacturers:
   a. Cla-Val Co
   b. Henry Technologies
   c. Watts Regulator Company
   d. Conbraco Industries / Apollo Valves
   e. Caleffi
   f. Substitutions: See Section 01 60 00 - Product Requirements.
2. ANSI Z21.22 certified, brass lead free body conforming to NSF-61, silicon washer, stainless steel stem and springs, automatic, direct vacuum relief maximum 250 degrees F, capacity ASME (BPV IV) certified and labelled.

2.14 GAS PRESSURE REGULATOR

A. Manufacturers:
1. Sensus
2. Fisher
3. Equimeter (Invensys).
4. Rockwell.
5. Maxitrol.
6. Substitutions: See Section 01600 - Product Requirements.

B. All gas pressure regulators shall be installed to meet or exceed the requirements of NFPA 54.

C. Gas regulators shall be die cast steel diaphragm, stainless steel interchangeable orifices, cast iron body, Buna-N with nylon fabric insert diaphragm.

D. Main control gas pressure regulators shall provide gas at maximum and minimum capacities indicated to reduce gas line pressure from 2 psi to 7 inch W.C. Refer to Drawings for additional requirements.

E. Monitoring gas pressure regulator to be same model and construction as Main control gas regulator.

F. All gas pressure regulators shall be valved to allow for service.

G. See drawings for Building Gas Regulator installation detail.

2.15 STRAINERS

A. Manufacturers:
1. Mueller.
2. Armstrong International, Inc.
3. Nibco, Inc
4. Sarco.
5. Hoffman.
6. Metalflex.
7. Conbraco Industries / Apollo Valves
8. Red-White Valve Corp.
9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Size 2 inch and Under:
   1. Threaded bronze body, lead free conforming to NSF-61-G, for 200 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
   2. Class 125, threaded bronze lead free body or iron body 400 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 1-1/2 inch to 4 inch:
   1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Sanitary, storm, and vent piping in return air plenums, chases exposed to plenums and through fire walls shall be cast iron. PVC piping will not be allowed in any of the plenum spaces noted.

C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

E. Install piping to maintain headroom, conserve space, and not interfere with use of space. Coordinate all installation with all other trades.

F. Group piping whenever practical at common elevations.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

I. Provide access where valves are not exposed. Coordinate size and location of access doors with Section 08 31 00.

J. Establish elevations of buried piping outside the building to ensure not less than 4 ft of cover for domestic water piping.

K. Install vent piping penetrating roofed areas to maintain integrity of roof assemblyand insulate roof penetration with spray foam. Vent piping termination through the roof to be cast iron no-hub. Paint vent through roof to color as selected by Architect/Engineer.

L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

M. Provide support for utility meters in accordance with requirements of utility companies.

N. Excavate in accordance with Section 31 23 16.

O. Install valves with stems upright or horizontal, not inverted. All valve handles shall be easily accessible.

P. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood or turn down elbow with insect screen.

Q. Install water piping to ASME B31.9.

R. Test all gas piping per NFPA 54.

S. All exposed gas piping located below the ceiling in kitchen and in other exposed areas shall be painted yellow or painted grey when exposed on the exterior of the building and properly identified. Minimum of three coats of paint is required. Refer to section 22 0553 for proper identification.

T. Unions and valves are not permitted in the gas piping in a return air plenum.

U. Provide 1/2" elastomeric insulation around all piping in walls and through floors.

V. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

W. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

X. Sleeve pipes passing through partitions, walls and floors.

Y. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

Z. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Bent hanger rods will not be allowed. Provide swivel type clamps to avoid bent hanger rods.
   3. Support horizontal piping as scheduled. No pipe or duct shall be hung from another pipe, pipes or electrical conduit.
   4. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   5. Place hangers within 12 inches of each horizontal elbow.
   6. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   7. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   8. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   9. Provide copper plated hangers and supports for copper piping.
   10. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
   11. Support cast iron drainage piping at every joint.

3.04 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install press fittings using only the manufacturers approved press fitting equipment.

C. Install unions downstream of valves and at equipment or apparatus connections.

D. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

E. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers. Gate valves will not be allowed on this project.

F. Install globe valves for throttling, bypass, or manual flow control services.

G. Provide check valves on cold water inlet to water heater, on hot water return connection to cold water line and as shown on drawings.

H. Provide plug valves in natural gas systems for shut-off service. Gas valves 2" and smaller may be 1/4 turn ball valves.

3.05 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.

3.06 TESTING AND REPAIR

A. Upon completion of each respective piping/ductwork system, but prior to insulating, covering, or backfilling, each system shall be thoroughly cleaned and flushed to remove construction dirt and foreign matter.

B. Test Piping as Specified Herein
   1. No piping work shall be concealed or covered until it has been inspected and approved by the project inspector, who shall be notified when the Work is ready for inspection. Work shall be completely installed and tested as required by this Contract and Ordinances of the local Municipality and shall be leaktight to the satisfaction of those making the inspection and the Architect/ Engineer.
   2. In general, pressure tests shall be applied to piping. In no case shall piping be subject to pressure exceeding its rating. Defective work shall be promptly repaired or replaced and test shall be repeated until the particular system and component parts thereof receive approval of the Architect/Engineer.
   3. Provide temporary equipment for testing, including pump, blower, and gauges. Test piping system before insulation is installed and remove control devices before testing. Test each natural section of each piping system independently, but do not use piping system valves or to isolate sections where test pressure exceeds valve pressure rating.
   4. Repair piping system sections which fail required piping test by disassembly and reinstallation, using new materials to extent required to overcome leakage. Do not use chemicals, stopleak compounds, mastics, or other temporary repair methods.
   5. Drain test water from piping systems after testing and repair work has been completed.
   6. Pressure for Testing of Piping Systems shall be as follows:
      a. Domestic Cold Water, Hot Water, and Non-Potable Water Piping
         1) Piping shall be tested and results approved by Architect/Engineer prior to application of insulation.
         2) Piping system shall be capped and subjected to a static water pressure of 50 psig above operating pressure and a minimum of 125 psig, and pressure maintained for 4 hours with no leaks or loss in pressure.
         3) Test source shall be isolated before conducting pressure tests.
      b. Sewer, Soil, and Waste Piping
         1) Soil and waste piping shall be plugged and subjected to not less than a 10 foot head of water. Water column shall be maintained for 2 hours with no leaks.
         2) Where subject to freezing, use air or smoke test for not less than 30 minutes and as required by code.
      c. Natural Gas Piping

1) Per NFPA #54, state and local utility codes.

7. Accurately record and report methods of testing, times, and dates of test, witnesses to the test, and the results of the test. Test reports shall be neatly typewritten on standard 8-1/2 inch by 11 inch sheets and submitted in 5 copies to Architect/Engineer for approval within 5 days after test has been performed.

C. Damage resulting from tests shall be repaired or damaged materials replaced, to satisfaction of Architect/Engineer, and at no cost to Owner.

3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 33 01 10.58.

B. Prior to starting work, verify system is complete, flushed and clean.

C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

F. Maintain disinfectant in system for 24 hours.

G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.08 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved strainer, reduced pressure backflow preventer and shutoff valves.

C. Provide new gas service as noted on construction documents. Coordinate requirements with Dominion East Ohio Gas Company.

3.09 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:
   a. Pipe Size: 1/2 inches to 1-1/4 inches:
      1) Maximum Hanger Spacing: 6.5 ft.
      2) Hanger Rod Diameter: 3/8 inches.
   b. Pipe Size: 1-1/2 inches to 2 inches:
      1) Maximum Hanger Spacing: 10 ft.
      2) Hanger Rod Diameter: 3/8 inch.
   c. Pipe Size: 2-1/2 inches to 3 inches:
      1) Maximum Hanger Spacing: 10 ft.
      2) Hanger Rod Diameter: 1/2 inch.
   d. Pipe Size: 4 inches to 6 inches:
      1) Maximum Hanger Spacing: 10 ft.
      2) Hanger Rod Diameter: 5/8 inch.
2. Copper Piping

a. Pipe size: Up to 1 inch
    1) Maximum hanger spacing: 5 ft.
    2) Hanger rod diameter: 3/8 inch
b. Pipe size: 1-1/4 inch to 2 inch
    1) Maximum hanger spacing: 8 ft.
    2) Hanger rod diameter: 3/8 inch
c. Pipe size: 2-1/2 inch
    1) Maximum hanger spacing: 9 ft.
    2) Hanger rod diameter: 1/2 inch
d. Pipe size: 3 inch to 4 inch
    1) Maximum hanger spacing: 10 ft.
    2) Hanger rod diameter: 1/2 inch

3. Plastic Piping:
    a. All Sizes:
        1) Maximum Hanger Spacing: 6 ft.
        2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION 22 10 05

SECTION 22 10 06
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.
B. Floor drains.
C. Roof drains.
D. Cleanouts.
E. Hose bibbs.
F. Hydrants.
G. Washing machine boxes and valves.
H. Refrigerator valve and recessed box.
I. Backflow preventers.
J. Water hammer arrestors / Shock Absorbers.
K. Mixing valves.
L. Washing machine boxes and valves.
M. Refrigerator connection boxes.
N. Trap Primers.
O. Trap Seal Protection Devices
P. Sumps and Interceptors.
Q. Water Meter.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.
B. Section 22 40 00 - Plumbing Fixtures.

1.03 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains; 2019.
B. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2017.
C. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011.
D. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011 (Reaffirmed 2016).
E. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2015.
F. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
G. NSF 372 - Drinking Water System Components - Lead Content; 2022.
H. PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Certificates: Certify that grease interceptors meet or exceed specified requirements.

E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

1.07 EXTRA MATERIALS

A. Supply for Owner's use in maintenance of project:
   1. Two loose keys for each outside wall hydrants and indoor hose bibbs.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Manufacturers:
   1. Zurn Industries, Inc.
   2. Wade.
   3. Josam Company.
   4. Jay R. Smith Manufacturing Company.
   5. Watts Regulator Company.
   6. MIFAB
   7. Sioux Chief
   8. ABT, Inc
   9. Hubell, Inc.
   10. Froet Industries
   11. Eric'sons Dura Trech
   12. ACO, Inc
   13. Substitutions: See Section 01 60 00 - Product Requirements.

B. Roof Drains (RD):
   1. Body: Lacquered cast iron with sump.
   2. Strainer: Removable polyethylene dome with vandal proof screws.
   3. Accessories: Coordinate with roofing type, refer to Section 07 5300:
      a. Membrane flange and membrane clamp with integral gravel stop.
      b. Adjustable under deck clamp.
      c. Dual roof drain deck flange and sump receiver.
      d. Waterproofing flange.
      e. Leveling frame.
      f. Adjustable extension sleeve for roof insulation.
      g. Perforated or slotted ballast guard extension for inverted roof.

C. Downspout Nozzles:
   1. Bronze round with straight bottom section.
   2. Alternate: Corrosion resistant aluminum alloy, round, powder coated. Color to be selected by architect.

D. Floor Drain (FD):

1. ASME A112.21.1; cast iron two piece body with double drainage flange, weep holes, and round, adjustable nickel-bronze strainer.

E. Floor Drain (FD-):
1. ASME A112.21.1; PVC two piece body with double drainage flange, weep holes, and round, adjustable nickel-bronze strainer.

F. Floor Drain (FD-):
1. ASME A112.21.1; cast iron two piece body with double drainage flange, weep holes, perforated removable sediment bucket, and round, adjustable nickel-bronze strainer.

2.03 CLEANOUTS

A. Manufacturers:
1. Wade
2. Jay R. Smith Manufacturing Company
3. Josam Company
4. Zurn Industries, Inc
5. Watts Regulator Company.
6. MIFAB
7. Sioux Chief
8. Neenah
9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Cleanouts at Exterior Surfaced Areas (RH):
1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Interior Finished Floor Areas (CO):
1. Cast iron, inside caulking, with adjustable nickel-bronze round tops. Provide "72" carpet marker in carpeted areas. Review Finish Schedule for locations.
2. PVC, inside caulking, with adjustable nickel-bronze round tops. Provide "72" carpet marker in carpeted areas. Review Finish Schedule for locations.

D. Cleanouts at Interior Finished Wall Areas (WCO):
1. Concealed screw plug with countersunk wrench hole and stainless steel screwed flush cover.

2.04 HOSE BIBBS

A. Manufacturers:
1. Zurn Industries, Inc
2. Woodford.
3. Acorn Engineering Company.
4. Wade.
5. Josam.
6. Jay R. Smith Manufacturing Company.
7. Watts Regulator Company.
8. MIFAB
9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Interior Hose Bibbs:
1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with lockshield and removable key where noted on drawings, integral vacuum breaker in conformance with ASSE 1011.
2. ASSE 1019; self-draining type with chrome plated wall plate hose thread spout, handwheel, and integral vacuum breaker.
3. Refer to fixture schedule on drawings for additional requirements.

2.05 HYDRANTS

A. Manufacturers:
   1. Zurn Industries, Inc
   2. Woodford.
   3. Acorn Engineering Company.
   4. Wade.
   5. Josam.
   6. Jay R. Smith Manufacturing Company.
   7. Watts Regulator Company.
   8. MIFAB
   9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall Hydrants:
   1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate lockable recessed box hose thread spout, lockshield and removable key, andintegral vacuum breaker.
   2. Refer to fixture schedule on drawings for additional requirements.
   3. Seal recessed box wall penetration air and water tight with clear silicone caulk on top and sides. Do not seal the bottom edge. It should be left open to allow for draining.

2.06 WASHING MACHINE BOXES AND VALVES

A. Box Manufacturers:
   1. Guy Gray Manufacturing.
   2. IPS Corporation/Water-Tite:
   3. Oatey Supply Chain Services, Inc: www.oatey.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Galvanized steel rough-in box with brass valves with single lever handle, socket for 2 inch waste, steel finishing cover.

2.07 REFRIGERATOR VALVE AND RECESSED BOX

A. Box Manufacturers:
   1. Guy Gray Manufacturing.
   2. IPS Corporation/Water-Tite: www.ipscorp.com
   3. Oatey: www.oatey.com
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Plastic preformed rough-in box with quarter turn brass shutoff valves, slip in finishing cover.

2.08 BACKFLOW PREVENTERS

A. Manufacturers:
   1. Zurn Wilkins
   2. ITT Lawler.
   3. Watts Regulator Company
   4. Conbraco Industries/ Apollo Valves
   5. Caleffi
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reduced Pressure Backflow Preventer: HVAC / Domestic water 3/4 inch to 2 inch.
   1. ASSE 1013; lead free bronze body with lead free bronze internal parts, and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that

opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two ball valves, strainer, and four test cocks. Pipe relief to nearest floor drain. All components shall be lead free in compliance with NSF-61-G.

C. Reduced Pressure Backflow Preventer: Domestic Water 3 inch and above.
   1. ASSE 1013; Epoxy coated Ductile Iron body or stainless steel body with stainless steel internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; threaded vent outlet; assembled with two gate valves, strainer, and test cocks. Pipe relief to nearest floor drain. All components shall be lead free in compliance with NSF-61-G.

2.09 WATER HAMMER ARRESTORS / SHOCK ABSORBER

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company.
   2. Zurn Industries, Inc.
   3. Watts Regulator Company.
   4. Wade.
   5. Josam.
   6. MIFAB
   7. Oatey
   8. Precision Plumbing Products
   9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Water Hammer Arrestors:
   1. Stainless Steel or Copper construction, ASSE Listed, Piston or Bellow type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range 34 to 250 degrees F and maximum 150 psi working pressure.

2.10 TRAP SEAL PROTECTION DEVICES

A. As an alternate to the trap primers for floor drains, a trap seal protection device can be used as allowed per the OBC, section 106.7.1

B. Manufacturers:
   1. Sureseal
   2. Mifab
   3. Oatey
   4. Green Drain, Inc.
   5. Zurn
   6. Mainline
   7. Substitutions: See section 01 6000 - Product Requirements

C. Construction: Mechanical device shall be an inline floor drain trap sealer, ASSE 1072 or IPC 09.1 listed. Body shall be constructed of ABS plastic. Diaphragm and sealing gasket to be constructed of neoprene rubber. Compression fitting sealing gasket 80 durometer.

2.11 MIXING VALVES

A. Mixing Valves:
   1. Manufacturers:
      a. Powers.
      b. Symmons
      c. Lawler
      d. Bradley
      e. Acorn

f. Conbraco Industries/ Apollo Valves
g. Caleffi
h. Arm
i. Leonard Valve Company
j. Guardian
k. Morris Group International
l. Substitutions: See Section 01 60 00 - Product Requirements.

2. Lavatory thermostatic mixing valve: Nickel plated brass/bronze lead free body conforming to NSF-61-G. Adjustable hand knob to allow for exact temperature adjustment. Meet the performance requirements of ASSE 1070 and CSA B125 certified. Capable to provide tempered water to multiple lavatories.
3. Accessories:
   a. Check valve on inlets.
   b. Volume control shut-off valve on outlet.
   c. Stem thermometer on inlets and outlet. Not required for lavatory mixing valve.
   d. Strainer stop checks on inlets.

2.12 WATER METER

A. Water Meter to be purchased from the Village of _____ Utilities Department. Coordinate size and requirements with the village utilities department.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on janitor rooms, flush valves, interior and exterior hose bibs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to service sinks, washing machine boxes, and flush valves serving water closets and urinals. All water hammer arrestors shall be accessible above the ceiling.

H. Carpet markers must be installed for cleanouts in all carpeted areas.

I. Thermostatic mixing valves shall be installed where and as denoted on the Drawings to mix hot and cold water, delivering a mixture at a constant temperature.

J. Install mixing valves at +5'-0" above finished floor.

K. Install lavatory thermostatic mixing valves serving single lavs directly below the lavatory. Locate as high as possible below lavatory.

L. Install lavatory thermostatic mixing valves serving multiple lavs above lay-in ceiling. Locate as to provide maintenance access.

M. Install trap primers for floor drains per state codes. Refer to detail on drawings for installation requirements.

N. Install all drains at 99'-11-1/2" elevation (Finish Floor = 100'-0") unless noted otherwise on drawings. Install floor drains in shower areas to accommodate a floor slope of 1:48. The minimum height of the floor drain shall be 99'-11-1/2".

END OF SECTION 22 10 06

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water softeners.

B. Tank Type Water Heater - Electric

C. Tankless Water Heater - Electric

D. Water Softeners

1.02 RELATED REQUIREMENTS

A. Commissioning
   1. Section 01 9113 - General Commissioning Requirements
   2. Section 01 9114 - Commissioning Authority Responsibility

B. Section 22 0519 - Meters and Gages

C. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

D. Section 22 0553 - Plumbing Identification

E. Section 22 1005 - Plumbing Piping

1.03 REFERENCE STANDARDS

A. ANSI Z21.10.1 - Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less; 2009.

B. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2007.

C. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 1996.

D. NFPA 70 - National Electrical Code; National Fire Protection Association; 1999.

E. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

F. ASHRAE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.

C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years ofdocumented experience.

B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

D. Contractor shall explain all components of the plumbing system and demonstrate their operation and maintenance to the owner's representative.
   1. All demonstrations and training shall be video-taped by the Plumbing Contractor. Two copies shall be turned over to the owner's representative.

1.06 CERTIFICATIONS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.08 WARRANTY

A. Provide five year manufacturer warranty for hot water storage tank.

B. Provide three year manufacturer warranty for commercial tank type water heater.

C. Provide five year manufacturer warranty for commercial water heater.

D. Provide manufacturer standard warranty for circulating pumps.

PART 2 PRODUCTS

2.01 TANKLESS WATER HEATER - ELECTRIC

A. Manufacturers:
   1. Chronomite, Inc: www.chronomite.com/#sle.
   2. Eemax.
   3. Bosch.
   4. Rheem.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Type: Automatic, electric.

C. Element shall be replaceable cartridge insert. Element shall be iron free, Nickel Chrome material. Heater shall be ftted with 1/2" compression fttings. Heater shall be installed upright with water connections on bottom. Hot water storage tanks prohibited.

D. Performance:
   1. Refer to drawings for performance information.

E. Electrical Characteristics:
   1. 120 volts, single phase.
   2. ____ amperes maximum fuse size.

F. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F, flanged or screw-in nichrome elements, enclosed controls and electrical junction box.

G. Accessories:

1. Water Connections: Brass.
2. Dip Tube: Brass.
3. Drain valve.
4. Anode: Magnesium.
5. Temperature and Pressure Relief Valve: ASME labeled.
6. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.

2.02 TANK TYPE WATER HEATER - ELECTRIC

A. Manufacturers:
1. Lochinvar.
2. Rheem.
3. A.O. Smith Corporation.
4. Bradford White.
5. State.
6. Substitutions: Refer to Section 01 6000 (01600) - Product Requirements.

B. Type: Automatic, electric, vertical storage.

C. Performance:
1. See drawings for design criteria.

D. Tank: Glass lined welded steel, thermally insulated with one inch thick glass fiber; encased in corrosion-resistant steel jacket; baked-on enamel finish.

E. Controls: Automatic water thermostat withexternally adjustable temperature range from 120 to 170 degrees F, flanged or screw-in nichrome elements, enclosed controls and electrical junction boxand operating light.Wire double element units so elements do not operate simultaneously.

F. Accessories: Provide:
1. Water Connections: Brass.
2. Dip Tube: Brass.
3. Drain Valve.
4. Anode: Magnesium
5. Temperature and Pressure Relief Valve: ASME labelled.

2.03 WATER SOFTENERS

A. Manufacturers:
1. Culligan International Company
2. Kinetico, Inc .
3. Ecodyne
4. Marlo
5. Watts
6. Sterling Water Treatment
7. Chandler Systems, Inc.
8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Scope:
1. Provide as indicated a vertical pressure type water softener system complete with pressure vessel, softening resin, control valve, brine maker and electronic controller. All equipment and material supplied shall be in compliance with the specifications as intended for a complete and operation system.

C. Performance and Design Data:

1. Design based on Culligan Hi-Flo 3e Water Softening System configured as Duplex Alternating/Water Meter/Demand with Brine Water Reclaim.
2. The purpose of the water softener system is to remove mineral hardness from a known water supply to a level not to exceed 17.1 mg/L, as determined by an accepted ASTM or EDTA test method, when the system is operated at 48 gpm and in accordance with the operating instructions. The system will be capable fo supplying 9231 gallons of softened water between regenerations based on the influent water analysis listed below.
3. The system performance is rated at a design flow rate of 90 minutes with a pressure drop of 25 psi.
4. Influent Water Analysis:
    a. Total Hardness, gpg: 13.0
    b. Eff. Hardness, gpg @ 100% capacity: 13.0
    c. Iron, FE: 0.05 mg/l
    d. Calcium: 104.3 mg/l
    e. Magnesium: N/A
    f. Manganese, Mn: N/A
    g. Turbidity, NTU: N/A
    h. Color: 0
    i. Total Dissolved Solids (TDS): 694 mg/l
5. Design Parameters
    a. Normal System Flow & Pressure Drop: 45 gpm @ 15 psi
    b. Maximum System Flow & Pressure Drop: 60 gpm @ 25 psi
    c. Backwash/Rinse Flow: 8 gpm
    d. Backwash Volume: 252 gpm
    e. Daily Water Usage: 8000 gpd
    f. Daily hours of water demand: 8 hours
    g. Operating Temperature Range: 40-100 degrees F
    h. Operating Pressure Range (System): 30-120 psi
    i. Electrical Requirements: 24 volts AC, 60 Hz, 1ph (dedicated receptacle)
    j. System Dimension: 44in W x 85in H
    k. Effluent Water Quality: Zero (0) gpg hardness (ASTM soap test method).

D. Construction:
1. Softener Tank: Each system shall include two (2) tank(s). Each softener tank shall be 16.0 in. in diameter. The overall tank height (less base) shall be 65.0 in., sufficient to allow for a proper freeboard space above the resin bed for adequate expansion of the resin during backwashing. Tank(s) shall be manufactured of polyester reinforced by a continuous roving glass filament overwrap. The top opening will be 4"-8 UN threaded and the tank bottom will be supported on a molded structural base.
2. Distribution System:
    a. The upper distribution system shall be of the single point diffuser type to dispense water laterally to avoid channeling within the resin bed.
    b. The lower distribution system shall be of the single point distributor type, constructed of PVC pipe and a fine slotted strainer to provide even flow distribution through the resin bed. The distribution system shall be embedded in a two layer subfill of washed inorganic material to support the resin bed.
3. Exchange Resin: The ion exchange resin shall be virgin high capacity "standard mesh" of sulfonated polystyrene type stable over the entire pH range with good resistance to bead fracture from attrition or osmotic shock. Each cubic foot of resin will be capable of removing 30000.0 grains of hardness as calcium carbonate when regenerated with 15.0 lbs of salt. The resin shall be solid, of the proper particle size of 20-50 mesh, U.S.

standard screen and will contain no agglomerates, shells, plates or other shapes that might interfere with the normal function of the water softener. The resin shall be manufactured to comply with the food additive regulation 21 CFR 173.25 as set forth by the USFDA. The system shall include 4.0 cu ft of exchange resin per vessel and a total of 8.0 cu ft of resin for the system.

4. Brine System:
    a. Brine system shall be capable of brine reclaim.
    b. Provide a complete brine system consisting of a plastic tank, cover, salt platform, brine well, an automatic brine valve and all necessary fittings for operation with the water softening system. The system shall consist of a combined brine measuring and salt storage tank with salt platform. The tank will be sized 24.0 in. x 50.0 in.; the system will include a total of one (1) brine tank(s). The brine tank can hold 800.0 lbs of salt which provides for 13.3 regenerations per salt fill. The brine tank will be equipped with a float operated non-corrosive field serviceable brine float valve for automatic control of brine withdrawal and fresh water refill. The brine valve will automatically open to admit brine to the resin tank during eduction and close automatically providing positive shut-off to prevent air from entering the system. The brine valve will also regulate the flow of soft water into the brine tank during refill. The brine valve works with the timed fill feature of the main operating valve controls to admit the correct volume of fresh water to the brine tank in accordance with the refill time setting in the control program. The brine valve will include a float operated safety shut-off valve as a back up to the timed refill from the main operating valve control to prevent brine tank overflow.

E. Main Operating Valve:
    1. The main operating valve shall be of a top mount design constructed of all brass and sized with 2.0 inch NPTI inlet and outlet connections.
    2. The main operating valve will be of the motor driven, mechanically activated design with five (5) positions to accomplish the regeneration steps of backwash, brine draw/rinse, fast rinse and brine refill, in addition to the service position.
    3. The main operating valve shall incorporate self adjusting flow regulators to control the rate of flow and prevent resin loss during backwash regardless of system pressure fluctuations between 30.0 and 120.0 psi.
    4. The main operating valve will be fitted with a fixed orifice eductor.
    5. The unit shall be supplied so that the valve will not allow automatic bypass of untreated water during regeneration. The bypass shall be integral to the main operating valve body and be capable of being easily modified to allow untreated water bypass.

F. Controls:
    1. A fully integrated programmable microprocessor driven electronic controller shall be provided to automatically cycle the main operating valve through the regeneration sequence. The electronic controller shall be designed and manufactured by the same manufacturer as the water treatment equipment.
    2. The controller shall be capable of initiating a regeneration by accepting an internal signal from the controller time keeping device; an external Hall-Effect flow sensor, an external device such as a remote start push-button or any combination of these methods. The controller shall sequence all steps of an automatic regeneration and automatically return the softener to a service or stand-by mode. The initiating time and/or volume setpoints shall automatically reset upon completion of the regeneration sequence.
    3. The controller shall include a sealed keypad, capable of programming all controller functions, located inside the controller enclosure. The controller display shall be a multi-line OLED display capable of full text readouts of operating status and codes.

4. An audible alarm beeper capable of emitting a tone of ~70 dBA shall be available but capable of being disabled if so desired.
5. The controller shall allow for a manual initiation of the automatic regeneration sequence by utilizing a regeneration selection from the controller program.
6. The controller shall operate on a low voltage electrical system. The system shall include a UL/CUL listed transformer. The entire electronic control package and its associated inputs/outputs shall require not more than 24 VAC @ 100VA.
7. The controller shall utilize EEPROM to save pertinent programmed data and statistical functions. The controller must retain all functionality for power interruptions of less than 12 hours. A battery backup shall be installed and capable of maintaining the time of day for a minimum of 5 years.
8. An operator selected program of immediate volume initiated regeneration for alternating twin configurations shall be available. The controller shall be capable of being programmed in the field without additional interface devices. The controller shall indicate various data that includes flow rate, capacity remaining, total flow since installation, number of regenerations in the last 14 days, days since the last regeneration, total number of regenerations for the life of the unit, time of day, and unit in regeneration.
9. Regeneration sequence timers: The controller shall allow control customization of individual regeneration cycle times, each programmable from 1 - 99 minutes. The regeneration cycle and time of cycle remaining shall be displayed when in regeneration.
10. Controller Functions:
    a. Lockout function: The controller shall include a lockout to prevent unauthorized personnel from altering program data.
    b. Regeneration override: The controller shall include a function to direct pre-programmed regeneration after a user determined period of time (hours or 24 hour intervals) without an input signal from another regeneration initiation device.
    c. Alarm status indicator: The controller shall monitor operation of internal functions. If a fault is identified, the need for operator intervention will be signaled visually within the controller display.
    d. Two Auxiliary Outputs: Two Auxiliary Outputs shall be integral to the controller circuit board. Each Output shall be capable of being programmed to provide power to a "Normally Open" or "Normally Closed" contact (user choice). These 24VAC outputs shall be used only for the purpose of energizing a relay coil.
    e. Flow rate indication: The controller shall be capable of indicating the flow rate of the treated water.
    f. Totalizer: The controller shall include a totalizer function and a display capacity to 99,999,999 units before resetting to zero. The totalizer value shall be displayed through the controller display during operation

G. Flow Sensor:
1. A flow sensor package shall be provided consisting of an insertion-type Hall Effect flow transducer with an appropriately sized installation fitting; the package shall include a total of one (1) flow sensors with fittings.
2. The fitting provided shall be 2.0 inches, compatible with the specified piping. It will be designed to allow ease of removal of the sensor for inspection without modification of the piping system. A 15 foot length of cable shall be provided for direct connection to the system controller.
3. The flow sensor package provided shall be functional within the flow range of 1.5 to 150.0 gpm and will be provided with a 2.0" flow sensor installation fitting.
4. The operating temperature/pressure range of flow sensor fittings shall be 34°-100°F at 100.0 psi max.

5. The wetted surfaces of the flow sensor shall be constructed of non-corroding materials such as polypropylene, black Polyvinylidene (PVDF) and titanium.
6. The flow sensor shall have an accuracy to 1% over full range and repeatability to +/-0.5% of full range.

2.04

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. All plumbing equipment should be started up by a manufacturer representative.

C. Coordinate with plumbing piping and related fuel piping and electrical work to achieve operating system.

D. Install and place in operation the water heater system as shown on the Drawings, complete with piping, supports, etc., and as recommended by the manufacturer. System shall meet or exceed state and local codes.

E. Provide shut-off valves and unions entering and leaving water heater. Provide check valve on cold water line to heater before expansion tank.

F. Expansion tank(s) shall be provided where, and as denoted on the drawings, thus providing a controlled space for the expansion of system water.

G. Water Softener:
   1. Factory authorized service representative shall provide startup and owner training for water softener system.
   2. Division 22 plumbing contractor to provide initial fill of salt for each brine tank at the completion of the project.

END OF SECTION 22 30 00

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush Valve Water closets.

B. Wall Hung Urinals.

C. Lavatories.

D. Sinks.

E. Service sinks.

F. Electric water coolers.

G. Showers.

H. Combination Emergency Drench Shower / Eye Wash Station

1.02 RELATED REQUIREMENTS

A. Section 06 41 00 - Architectural Wood Casework: Preparation of counters for sinks and lavatories.

B. Section 07 90 05 - DO NOT USE - Joint Sealers: Seal fixtures to walls and floors.

C. Section 22 10 05 - Plumbing Piping.

D. Section 22 10 06 - Plumbing Piping Specialties.

E. Section 22 30 00 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration.; 2013.

B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).

C. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

D. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018.

E. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2017.

F. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2005.

G. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2015.

H. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

I. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.

J. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

K. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

L. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

M. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Samples: Submit one sets of color chips for each standard color.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Install per the requirements of the current plumbing code.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

A. Provide manufacturer's standard warranty for all plumbing fixtures and trim.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

A. Manufacturers:
   1. American Standard, Inc
   2. Kohler Company
   3. Zurn Industries, Inc
   4. Sloan Valve Company.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Bowl:
   1. ASME A112.19.2; wall hung, siphon jet flush action, vitreous china closet bowl, with elongated rim, 1-1/2 inch top spud, china bolt caps.
      a. Water Consumption: 1.28 gallon per flush

C. Flush Valve
   1. Manufacturers:
      a. Sloan Valve Company.
      b. Kohler.
      c. American Standard.
      d. Zurn Industries, Inc.
      e. Geberit
      f. Moen
      g. Hydrotek
      h. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Manual Flush Valves: ASME A112.19.2; exposed chrome plated, diaphragm or piston type with oscillating handle, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker

3. Water consumption: 1.28 gallons per flush.

D. Seats:
1. Manufacturers: (Refer to Schedule on Drawings for Model numbers)
a. American Standard, Inc
b. Beneke
c. Bemis Manufacturing Company.
d. Church Seat Company.
e. Olsonite.
f. Zurn Industries, Inc
g. Substitutions: See Section 01 60 00 - Product Requirements.
2. Solid white plastic, open front, extended back,self-sustaining hinge, brass bolts, with cover.

E. Carriers:
1. Manufacturers:
a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
b. Watts Drainage
c. JOSAM Company.
d. Sloan Valve Company.
e. Zurn Industries, Inc.
f. Wade.
g. Substitutions: See Section 01 60 00 - Product Requirements.
2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.
3. 750 pound load capacity

2.03 WALL HUNG URINALS

A. Manufacturers
1. American Standard, Inc
2. Kohler Company
3. Zurn Industries, Inc
4. Sloan Valve Company
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Urinals:
1. Vitreous china, ASME A112.19.2, vitreous china, wall hung, high efficiency washout urinal with shields, integral trap, 3/4" top spud, concealed support.
a. Water Consumption: 0.125 gpf (pint).

C. Flush Valve
1. Manufacturers:
a. Sloan Valve Company.
b. Kohler.
c. American Standard.
d. Zurn Industries, Inc.
e. Geberit
f. Moen
g. Hydroteck
h. Substitutions: See Section 01 60 00 - Product Requirements.
2. Manual Flush Valves: ASME A112.19.2, exposed chrome plated, diaphragm or piston type complete with oscillating handle, escutcheon, integral screwdriver stop and vacuum breaker.

3. Water Consumption: 0.125 gallon per flush (1 pint)

D. Carriers:
   1. Manufacturers:
      a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
      b. Watts Drainage.
      c. JOSAM Company.
      d. Sloan Valve Company.
      e. Zurn Industries, Inc.
      f. Substitutions: See Section 01 60 00 - Product Requirements.
   2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.04 LAVATORIES

A. Manufacturers:
   1. American Standard, Inc
   2. Kohler Company.
   3. Zurn Industries, LLC: www.zurn.com/#sle.
   4. Bradley
   5. Acorn Engineering
   6. Just
   7. Elkay
   8. Willoughby, Inc.
   9. Franke
   10. Substitutions: See Section 01 60 00 - Product Requirements.

B. Vitreous China Wall Hung Basin:
   1. ASME A112.19.2; vitreous china wall hung lavatory, rectangular basin with splash lip, front overflow, soap depression, and concealed arm supports.
      a. Drilling Centers: 4 inch.

C. Vitreous China Countertop Basin:
   1. ASME A112.19.2; vitreous china self-rimming counter top lavatory, oval bowl, front overflow, soap depression, seal of putty, calking, or concealed vinyl gasket.
      a. Drilling Centers: 4 inch.

D. Stainless Steel Wall Hung Basin:
   1. Wall hung, ADA compliant seamless welded construction, fabricated of 18 gauge stainless steel, with integral-formed backsplash and over flow. Furnish with wall clips and integral apron clip for wall mounting.
      a. Drilling Centers: 4 inch.

E. Supply Faucet:
   1. Manufacturers: (Refer to Schedule on Drawings for Model Numbers)
      a. Zurn Industries, Inc.
      b. Chicago.
      c. American Standard Inc.
      d. Kohler
      e. Moen.
      f. Speakman
      g. Hydrotek
      h. T & S Brass.
      i. Sloan Valve Company.

j. Substitutions: See Section 01 6000 - Product Requirements.

2. Manual Lavatory Faucet
   a. ASME A112.18.1; chrome plated brasslead free in accordance with NSF-61-G, supply fitting with open grid strainer, 1/4 turn ceramic disc valving, water economy aerator, ADA indexed handles, lever type. All removable parts of faucet shall be vandal resistant.
      1) Supply Faucet Centers: 4 inch
      2) Water Consumption: 0.35 gpm

F. Accessories:
   1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
   2. ASSE 1070 compliant, point of use thermostatic tempering valve where noted. Mount above ceiling in accessible location.
   3. Grid Strainer.
   4. Removable key handle stops.
   5. Flexible supplies.
   6. Under sink piping covers. Refer to specification section 22 0717 Piping Safety Covers.

G. Carrier:
   1. Manufacturers:
      a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
      b. Zurn Industries, Inc.
      c. JOSAM Company: www.josam.com.
      d. Sloan Valve Company: www.sloanvalve.com.
      e. Wade.
      f. Watts Drainage.
      g. Substitutions: See Section 01 60 00 - Product Requirements.
   2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.05 SINKS

A. Manufacturers: (Refer to Schedule on Drawings for Model numbers)
   1. Just
   2. Elkay
   3. American Standard Inc.
   4. Kohler Company.
   5. Acorn Engineering
   6. Franke
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Single Compartment Bowl:
   1. ASME A112.19.3M; 18 gage thick, Type 304 stainless steel, self-rimming and undercoated, with ledge back drilled for trim.
      a. Drain: 1-1/2 inch chromed brass drain.

C. Supply Faucet:
   1. Manufacturers:
      a. Zurn Industries, Inc.
      b. Chicago.
      c. American Standard Inc.
      d. Moen.
      e. T & S Brass.
      f. Sloan Valve Company

g. Kohler.
h. Speakman.
i. Substitutions: See Section 01600 - Product Requirements.

2. Faucets: ASME A112.18.1; chrome plated brass supply, lead free in accordance with NSF-61-G, ceramic disc valving with swing spout, vandal proof water economy aerator, ADA compliant indexed lever handles. Refer to drawings for additional requirements.
   a. Water consumption: 1.5 gpm

D. Accessories:
1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
2. Removable key handle stop.
3. Rigid supplies.
4. Strainer basket where required.

2.06 SHOWERS

A. Manufacturers: (Refer to Schedule on Drawings for Model numbers)
1. Bradley.
2. Leonard.
3. Symmons.
4. Powers.
5. Willoughby, Inc.
6. American Standard
7. Kohler Company.
8. Speakman
9. Zurn.
10. Acorn Engineering
11. Substitutions: See Section 01 60 00 - Product Requirements.

B. Trim:
1. SH: ASME A112.18.1; concealed shower supply with ASSE 1016 thermostatic mixing valve control, pressure activated shower mixer with stainless steel pressur ebalancing piston, adjustable limit stops and inlet stops. Hand held shower with 60 inch stainless steel braided hose, slide bar. All exposed parts to be chrome plated brass.
2. SH: ASME A112.18.1; concealed shower supply with touch time control, pressure activated shower mixer with stainless steel pressure balancing piston, adjustable limit stops and inlet stops, all exposed items to be stainless steel or chrome plated brass, exposed stainless steel shroud cover, institutional shower head, recessed soap dish. All components shall be vandal resistant. Unit to be provided with stainless steel panel that extends from top of shower to above ceiling to conceal supply piping. Refer to schedules on drawings for addtional requirements.
   a. Water Consumption: 1.5 gpm
3. SH: Provide pressure activated shower mixer with stainless steel pressure balancing piston, ASSE 1016 integral mixing valve, single lever handle, adjustable limit stops and inlet stops, recessed stainless steel shower panel, adjustable high temperature limit stop set at 110 degrees, self draining soap dish, institutional shower head. All components shall be vandal resistant. Refer to schedules on drawings for addtional requirements.
   a. Water Consumption: 1.5 gpm
4. SH-1: Provide pressure activated shower mixer with stainless steel pressure balancing piston, ASSE 1016 integral mixing valve, single lever handle, adjustable limit stops and inlet stops, recessed stainless steel shower panel and self draining soap dish, institutional shower head, diverter valve, lever operated, hand held shower with 60" stainless steel

hose, wall hook, elevated inline vacuum breaker. All components shall be ADA Compliant and vandal resistant. Refer to schedules on drawings for addtional requirements.
a. Water Consumption: 1.5 gpm

C. Low-Flow Shower Head:
1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 1.5 gpm flow control.

D. Accessories:
1. Shower control shall be equal to Bradley Touch Time Electronic Control System with each station controlled through the use of a solid state control circuitry. The system will supply tempered water to the shower head through a solenoid valve, timed from an electronic circuit board, activated by a low voltage non-hold open pushbutton. The electronic circuit board shall be capable of controlling one station and shall be sealed within the electronic pack attached to the solenoid. The circuit board shall provide a minimum of 180 seconds metering cycle. The manufacturer shall provide a 120 VAC/24 VAC class II transformer that is capable of controlling up to four showers at one time. Battery operated controls will not be accepted.
2. Refer to drawings for additional accessory requirements.

2.07 ELECTRIC WATER COOLERS

A. Manufacturers:
1. Halsey Taylor
2. Tri Palm International/Oasis
3. Elkay Manufacturing Company: www.elkay.com/#sle.
4. Haws Corporation: www.hawsco.com/#sle.
5. Murdock Manufacturing, Inc: www.murdockmfg.com/#sle.
6. Franke Group
7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fountain:
1. Surface mounted electric water cooler with stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with flexible, bacteria resistant stream guard, automatic stream regulator, filter capable of treating 1500 gallons, front stainless steel push button, mounting bracket, vandal resistant, standard finish, refrigerated with integral air cooled condenser and stainless steel grille.
a. Water cooler shall be lead free in accordance with NSF-61-G.
2. Capacity: 8 gallons per hour of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
3. Electrical: 115 V, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.
4. Bottle Filler: Materials to match fountain.

2.08 BI-LEVEL, ELECTRIC WATER COOLERS

A. Water Cooler: Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, stainless steel push button, mounting bracket; integral air cooled condenser and stainless steel grille.
1. Capacity: 8 gallons per hour of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
2. Electrical: 115 V, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

B. Bottle Filler: Materials to match fountain.

2.09 LAVATORY SYSTEMS

A. Manufacturers:
   1. Bradley Corporation.
   2. Acorn Engineering Company.
   3. Sloan Valve Company: www.sloanvalve.com.
   4. Willoughby Industries.
   5. Intersan Manufacturing Company.
   6. Zurn Industries, Inc.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Bowl:
   1. Densified solid surface material composed of an acrylic modified polyester resin. Vandal resistant base cabinet and sensor panel.

C. Sensor Operated Faucet:
   1. Manufacturers: (Refer to Schedule on Drawings for Model Numbers)
      a. Zurn Industries, Inc.
      b. Sloan Valve Company.
      c. American Standard.
      d. Kohler.
      e. Chicago.
      f. T&S Brass
      g. Moen.
   2. ADA Compliant, sensor activated, plug-in powered, chrome plated single hole installation, hand washing faucet with 0.5 GPM Laminar flow spray head, splash proof circuit control module, 6 VDC plug-in powered sensor control with battery backup, cover-plate for 4" centers.

D. Accessories: Infrared Sensor control, support frame, stainless steel front access panel, thermostatic mixing valve conforming to ASSE 1070, grid strainer, and 0.5 gpm flow aerators.

E. Color: To be selected by Architect from manufacturer's available colors. Submit color samples to architect. Samples shall be of actual material. Paper type color samples will not be acceptable.

2.10 SERVICE SINKS

A. Manufacturers:
   1. Acorn Engineering Company: www.americanstandard-us.com/#sle.
   2. Zurn Industries, Inc:
   3. E. L. Mustee & Sons, Inc.
   4. Fiat.
   5. Swan.
   6. Willoughby, Inc.
   7. Stern Williams Products
   8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Floor Service Sink:
   1. 24 x 24 x 10 inch high white molded fiberglass, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.

C. Trim:
   1. Trim Manufacturers: (Refer to Schedule on Drawings for Model numbers)
      a. Zurn Industries, Inc: www.zurn.com.
      b. Chicago.

c. American Standard Inc.
d. Moen.
e. T & S Brass.
f. Sloan Valve Company: www.sloanvalve.com.
g. Kohler Company.
h. Speakman
i. Substitutions: See Section 01 6000 - Product Requirements.

2. ASME A112.18.1 exposed wall type supply, ceramic disc valving with ADA lever handles, spout wall brace, vacuum breaker, check valves in water connections, hose end spout, strainers, eccentric adjustable inlets, bucket hook, removable key handle stops with covering caps and adjustable threaded wall flanges.

D. Accessories:
1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
2. Hose clamp hanger.
3. Mop hanger.
4. Bumper Guard.
5. Stainless Steel Wall Guards (Set of 2) - #20 Gage

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible braided stainless steel supply hose to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture.

F. All shower components shall be sealed from moisture. All wiring connections shall be greased to prevent corrosion.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. All science sinks, and matching fixtures to be supplied by casework manufacturer. Casework manufacturer will supply stub to below countertop for all water and gas connections. Coordinate location of stub-ups with the general contractor.

B. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation. Provide casework manufacturer with templates for cutting sink holes.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

3.07 SCHEDULES

A. Fixture Heights: Install fixtures to heights above finished floor as indicated on plumbing fixture schedule on drawings. Refer to drawings for locations of ADA fixtures.

END OF SECTION 22 40 00

SECTION 23 05 01
MECHANICAL MATERIALS & METHODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping specialties

B. Lubrication and packing

C. Installation requirements common to piping systems and equipment specification sections

D. Concrete Housekeeping Pads.

E. Emergency repairs or operation

F. Provisions for later installations

G. Final completion

H. Project Conditions

I. Quality Assurance

J. Supervision and cooperation

K. Coordination drawings

L. Maintenance and operating manuals

M. Record drawings

1.02 RELATED REQUIREMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1 and 2, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 1200 - Multiple Contract Summary for Work under other contracts.

C. Commissioning

D. Refer to Section 07 8400 - Firestopping. Electrical Contractor shall provide submittals for fire stopping based on Section 07 8400.

E. Refer to Division 26, Electrical Specifications, and to the requirements stated therein applicable to the Mechanical Work, where coordination of trades is covered.

F. The Drawings prepared for this Project are an outline to show where pipes, ducts, and apparatus must go in order to harmonize with the building and installations of the various trades. Work must be installed in accordance with the Drawings insofar as possible. Drawings shall be carefully checked during the course of bidding and construction. If discrepancies, errors, or omissions are discovered prior to or during the construction phase, notify the Engineer immediately for interpretation or correction. Take necessary measurements and be responsible for same, including clearances for equipment that is to be furnished. The Architect/Engineer shall reserve the right to make minor location changes of piping and equipment where such adjustments are deemed desirable from an appearance or operational standpoint. Such changes will be anticipated sufficiently in advance to avoid extra work or unduly delay progress on the Project.

G. The general building drawings shall be used to obtain dimensions and exact locations and as a check with other Contractors to avoid interferences with their Work. Refer to applicable Drawings on branches of the Work where other trades are involved on the Project so that added field work and job delays resulting from conflicts between crafts can be avoided. Piping

or ductwork that is prefabricated before coordinating with the other trades may have to be redone at no additional cost if conflicts are encountered.

1.03 SUMMARY

A. The Contractor(s) shall provide the labor, materials, equipment, appliances, services and transportation, and perform the operations in connection with the construction and installation of the Work. Work shall be as herein specified and as denoted on the accompanying Drawings.

B. The Contractor(s) shall arrange and pay for permits and inspections required in connection with the Work. The Contractor shall apply for and pay for meters, regulators, recorders, and gauges required. The Contractor must present to the Owner through the Architect/Engineer, properly signed certificates of final inspection by the governing authorities when they become due and shall not cover up Work until approved by those authorities.

C. Materials or labor obviously required to fully complete the Work shall be included, even though each item necessarily involved is not specifically mentioned or shown. Such Work and materials shall be furnished and shall be of the same grade or quality as the parts actually specified and shown. Should there be a conflict between the plans and Specifications, the greater quantity and better quality shall be furnished.

D. Should an overlap of Work between the various trades become evident, the Engineer shall be notified. Such an event shall not relieve the Contractor of the responsibility for the Work called for under his branch of the Specifications until a written clarification or directive is issued concerning the matter.

E. Arrange all mechanical supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.
   1. If support must occur between panel joints, then threaded rods shall be dropped from both panel points, an adequate angle to both, and then the support attached to the angle is required.
   2. Unless specifically indicated or approved by Garmann Miller & Associates Inc. do not provide support from roof decks.

F. Related Work Specified Elsewhere
   1. Firestopping is Work of this Section though fire barrier sealants (firestopping) for walls and floors are specified in Section 07 8400. Contractors are responsible for proper sizing of their sleeves and core-drilled holes so that they are at least 1-1/2 inches larger in diameter than the penetrating items. Schedule 40 steel sleeves and core-drilled holes made excessively large or made and not used, will be firestopped and charged to the Contractor who was responsible.

G. Related Work by Others
   1. Motors which are shipped loose from the mechanical equipment shall be installed as Work under Division 26, Electrical, or other trades as may be required, at the expense of the Contractor furnishing the loose motor(s).
   2. Unless otherwise stipulated under a specific Section of this Division, motor disconnects and starters shall be provided as Work under Division 26, Electrical.
   3. Electric power wiring shall be included as Work under the electrical wiring section of Division 26, Electrical, except as follows:
      a. Control wiring regardless of voltage shall be included as Work under specific Sections of Division 23.
      b. Internal package type wiring as specified under specific Sections of Division 23.

H. Cutting of water lines, electric conduit, or similar service lines in the course of Work performed under this Section shall be immediately repaired as part of the Work of this Section.

1.04 ALTERNATIVES

A. This section describes a base bid product; refer to Section for an alternative product.

B. This section describes an alternative product; refer to Section for the base bid product.

1.05 REFERENCE STANDARDS

A. Standards are described by reference to various associations. These are in addition, but not limited to, to those listed in:
   1. AGA American Gas Association
   2. ANSI American National Standards Institute
   3. ASHRAE American Society of Heating, Refrigeration, and Air Conditioning Engineers
   4. ASME American Society of Mechanical Engineers
   5. AWS American Welding Society
   6. AWWA American Water Works Association
   7. CISPI Cast Iron Soil Pipe Institute
   8. NFPA National Fire Protection Association
   9. OSHA Occupational Safety and Health Act
   10. SMACNA Sheet Metal and Air Conditioning Contractors National Association
   11. UL Underwriters' Laboratories, Inc.

B. Work shall be in complete accordance with codes, rules, and ordinances, regulations of authorities, bodies, associations, and governments, having proper or legal jurisdiction. Specifically, the following requirements shall be met in their entirety.
   1. State and Local Rules, Regulations, Codes, Statutes, and Ordinances
   2. Ohio Mechanical Code, 2017 Edition.
   3. ASHRAE 90.1-2010; Energy Standard for Buildings Except Low Rise Residential Buildings.
   4. ASHRAE 62.1-2016; Ventilation for Acceptable Indoor Air Quality.
   5. NFPA 70 - National Electrical Code; National Fire Protection Association; 2017 applicable requirements.
   6. NFPA 54 - National Fuel Gas Code.
   7. National Board of Fire Underwriters
   8. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 1993 (and Revision 1,2,3).
   9. Other Codes and Standards as specifically noted in each Section of the Specifications.
   10. Americans with Disabilities Act (ADA)

C. References made to codes and standards, in these Specifications or on the Drawings, shall be taken to mean the latest edition, amendment, or revision of such reference in effect as of the date indicated on the Bid Documents unless otherwise noted.

1.06 SUBMITTALS

A. Submit capacity requirements, catalog cuts, and illustrations in accordance with requirements of specifications and as required by specific Sections of this Specification.

B. Shop Drawings shall be prepared by the Contractor or supplier.
   1. Where limited space is available due to the nature of the Work, the requirements for shop and working drawings will apply, and the Contractor is required to prepare complete shop drawings showing the exact disposition of apparatus, equipment, piping, ductwork, and the like, and its relation to the building so there will be no irregularities or interferences. Shop drawings shall be prepared in coordination with other Contractors and other trades.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Instruments used by the Contractor shall be accurately calibrated and maintained in good working condition.

B. Products and test instruments used shall be subject to approval of Architect/Engineer.

C. Products and test instruments used shall be provided by each respective Contractor.

D. Note that systems involved under this Contract heading shall be in accordance with applicable requirements listed in NFPA Standard 90A.

E. Materials used in this Contract shall be those specified herein unless proposals for the use of alternate materials have been submitted and accepted in writing, as provided herein before. Materials shall be strictly first grade of their kind and shall be new and in first-class condition when installed. Damaged materials will be rejected and must be replaced by proper and acceptable materials. Materials shall be similar and in accordance with the provisions of this Specification.

F. No materials or equipment may be installed under this contract heading which do not meet the approval of the authorities having jurisdiction. Specific materials may have certain restrictions or exclusions as to their usage, including where they may not be located. Such regulations shall be adhered to where applicable. The requirements and regulations of the local and state building codes and regulations currently adopted shall be adhered to.

G. Piping systems shall be installed by workmen having skills acquired by working at the trade which is recognized as necessary for competency.

H. Pressure piping systems installed shall conform to the requirements of the State piping and welding codes where applicable.

1.08 PROJECT CONDITIONS

A. Unless otherwise stipulated under a particular heading, the following rules relative to responsibilities of the several Contractors and subcontractors will apply.
   1. Each Contractor shall install roughing-in work pertaining to his trade for connection of Work performed under other Sections of these Specifications.

B. Certain areas will be designated for the storage of materials and equipment and cooperation with the Owner in minimizing interference with existing operations will be mandatory.
   1. Where possible, store materials inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.
   2. Follow manufacturer's instructions for receiving, inspecting, handling, storage, and protection of products prior to final installation

C. Equipment Clearances and Requirements
   1. For many items of equipment described in these Specifications, several manufacturers are listed. The manufacturer listed on the drawings is the make on which the layout was based and on which clearances, service required electrical, and plumbing characteristics, etc., have been checked. Additional manufacturers listed are considered acceptable.
   2. Due to the possibility of restrictions imposed by space limitations, the responsibility for resolving conflicts resulting from the use of equipment other than first named shall rest with the equipment supplier and the Contractor. Submittals for this equipment will be considered as a statement that clearances for access, service, maintenance, etc., have been checked and found adequate.
   3. Alternate equipment or the equipment of additional manufacturers named in these documents shall meet Base Bid Specifications. In the event such equipment or any equipment which the bidder proposes to furnish, deviates from the requirements of equipment first named regarding electric service, power wiring, control wiring, plumbing or

piping, sound attenuation, or vibration damping, it shall be the responsibility of the bidder to include in his price a sufficient sum to cover additional costs or charges resulting therefrom.

D. In general, the piping and ductwork shown on the Drawings shall be considered as diagrammatic for clearness in indicating the general run and connections required, and may not be shown in its true position. The piping and ductwork and equipment may have to be offset, lowered or raised, as required, or as directed at the site in order to accommodate field conditions.

1.09 SUPERVISION AND COOPERATION

A. Work done by the Contractor under this Division shall include the services of an experienced superintendent, who shall be constantly in charge of the work, together with the qualified journeymen, helpers, and laborers required to properly unload, install, connect, adjust, start, and operate, and test the Work involved, including related equipment and materials furnished under other contracts or by the Owner.

B. A Pre-Installation meeting shall convene one week before starting work of this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide motors and starter/disconnect switches having the voltage and electrical characteristics of the service available and where denoted on Drawings or as required.
   1. All motors shall be high efficiency type.

2.02 ESCUTCHEONS AND PLATES

A. Provide approved plates around each pipe passing through walls, floors, partitions, and ceilings when piping is exposed to view and on exterior of building. Plates shall be chrome-plated metal and sized to cover exposed ends of pipe insulation and pipe sleeves.

B. Floor plates shall be split-type, heavy chrome-plated and securely attached to the pipe.

2.03 PIPE SLEEVES

A. Sheet metal sleeves shall be fabricated from galvanized sheet metal and shall be of no less than 18 gauge metal for 3 inch diameter and smaller, 16 gauge metal for 4 inch to 6 inch diameter, and 14 gauge metal for 6 inch diameter and larger.

B. Steel pipe sleeves shall be fabricated from Schedule 40 galvanized steel pipe.

C. Sleeves for copper piping shall be of compatible material to prevent interaction of piping materials.

PART 3 EXECUTION

3.01 INSTALLATION

A. Lubrication and Packing
   1. Rotating and reciprocating equipment requiring lubrication shall be lubricated with the correct grade, type, and quantity of lubricant before being placed in service.
   2. Each shaft containing a packing gland shall be checked for condition by backing the packing gland off and examining for proper grade, amount, and type of packing as recommended by the manufacturer. Upgrade to proper standards as required.
   3. Maintain lubrication gaskets and packing during construction and assure that at the time of acceptance by the Owner are in first-class operating conditions.

B. Motors, Starters, Controls, and Wiring

1. Alignment of motors, that are factory coupled or mounted and field coupled and mounted, shall be performed by the equipment manufacturer and shall be rechecked after connections have been made and after 48 hours of operation in designed service.
2. Starter/disconnects, controls, and wiring shall be coordinated with the appropriate Contractors and completed as required by these Documents.

C. Cutting and Patching
1. Cutting and drilling of walls, slabs, and structural members, required in conjunction with Work under this Section, shall be done under the supervision of the Architect/Engineer. Work shall be neatly done, removing no unnecessary material. Holes, openings, etc., shall be located where they will not weaken the structure. No beams, joists, etc., shall be cut without the written consent of the Architect/Engineer.
2. Cutting of holes in masonry and concrete shall be performed with a core drill to minimize spalling, and limit damage to wall. Locations shall be accurately determined and checked, and the appropriate drill bit shall be used to minimize hole size.
3. Sleeves or thimbles for holes as well as escutcheons and trim plates shall be provided. Installation shall permit free movement of pipe.
4. Patching of work, where necessary, is to be done by a mechanic of the appropriate trade. Unless otherwise noted, patching for Work performed under this Section shall be immediately repaired as part of the Work of this Section.

D. Pipe Sleeves: Install pipe sleeves where piping passes through walls, floors, ceilings, and roofs.
1. Do not install sleeves through structural members of work, except as detailed on Drawings, or as reviewed and approved by Architect/Engineer.
2. Install sleeves accurately centered on pipe runs.
3. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run.
4. Where insulation includes vapor barrier jacket, provide sleeve with sufficient clearance for installation.
5. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves.
6. Extend floor sleeves 1/4 inch above level floor finish, and 3/4 inch above floor finish sloped to drain unless otherwise noted.
7. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.
8. Where insulated piping passes through fire barriers, stop insulation at barrier for fire barrier penetration seal.
9. Where piping passes through non-fire rated, or non waterproof, partitions, floors, and walls, apply pipe insulation continuous through pipe sleeves.
10. Do not install sleeves through suspended ceilings.
11. Caulk non-fire rated sleeves with sealant.

E. Protection
1. Provide proper protection to the building during the execution of Work involved under this contract heading.
2. This protection shall include covering apparatus, building surfaces, and other materials to protect same from dirt; adequate temporary connections to protect apparatus from damage and required shielding to protect finished parts of the building. The following shall apply where applicable:

a. Protect finished floors from chips and cutting oil by the use of metal chip receiving pans and oil proof floor covers.
b. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.
c. Protect equipment and finished surfaces from paint droppings, insulation adhesive, and sizing droppings, etc., by use of drop cloths.

3. Pumps, motors, fans, and other rotating/reciprocating equipment stored for this Project shall be adequately protected with openings, bearings, etc., covered to exclude dust and moisture. Stock piled pipe, valves, fittings, ductwork, etc., shall be placed on dunnage and protected from weather and from entry of foreign material.
4. During installation and until final connections are made, piping and ductwork shall be protected against entry of foreign matter. Equipment connections shall be carefully sealed until the actual time of system tie-in.
5. During construction, all air intake openings on variable frequency drives, control panels, and other electronic equipment shall be protected with a temporary filter. At completion of project, filters shall be removed.

F. Accessibility
1. Provide a union or flange in the piping at each screwed or welded valve, device, or item of equipment, and elsewhere as required for accessibility of repair. Each union shall be so installed as to permit the removal of item without disconnection of any piping except at the union.

3.02 CONCRETE HOUSEKEEPING PADS

A. Contractor shall refer to Specification Section 03 3000 for requirements of concrete housekeeping pads.

3.03 EMERGENCY REPAIRS OR OPERATION

A. The Owner reserves the right to make emergency repairs and protection of the equipment and systems in operation without voiding the Contractor's guarantee bond or relieving the Contractor of his responsibility during the bonding period.

B. The air handling units may be used for temporary heating. If units are used for temporary heating the heat wheel section shall be completely blanked off on both the supply and exhaust side to prevent any air, dust, etc. from passing through heat wheel. Any damage to the heat wheel due to unit use for temporary heating shall be replaced at no additional cost to the owner.

3.04 PROVISIONS FOR LATER INSTALLATIONS

A. Where work cannot be installed as the structure is being erected, the Contractor for such work shall provide and arrange for the building-in of boxes, sleeves, inserts, fixtures, and devices necessary to permit installation of the omitted work during later phases of construction. The Contractor shall arrange for layout, chases, holes, and other openings which must be provided in masonry, concrete, and other work.

B. The Contractor shall be responsible for becoming informed of the nature and arrangement of the materials and construction to which his work attached or passes through.

3.05 FINAL COMPLETION

A. Work shall be cleaned prior to Substantial Completion of the Work.

B. Retouch or repaint factory painted prime and finish coats where scratched or damaged. Whenever retouching will not be satisfactory, in the opinion of the Architect/Engineer, the Architect/Engineer has the option to require complete repainting until the desired appearance is obtained.

C. Deliver filters, belts, and equipment, as required by this Specification, to Owner for Division 23 - HVAC Systems and obtained signed receipts of delivery.

D. The Contractor shall clean equipment; restore damaged materials, remove grease, oil chemical, paint spots, and stains; and leave the Work in condition acceptable to Owner and Architect/Engineer.

E. On completion of his Work, the Contractor shall remove and see that each of his subcontractors removes from the site tools, equipment, surplus materials, and rubbish pertaining to his operations, and pay cost for such removal and disposition.

F. Contractor shall explain all components of the HVAC System and demonstrate their operation and maintenance to the owner's representative.
   1. All demonstration and training shall be video-taped by the HVAC Contractor. Two copies shall be turned over to the owner's maintenance staff.

3.06 COORDINATION DRAWINGS

A. Division 23 Mechanical Contractor shall be responsible for creating coordination drawings. Coordinate all coordination with fire protection contractor, plumbing contractor, electrical contractor, and general trades contractor.

B. All coordination drawings are to be created with a 3D modeling software that is compatible with Autodesk Navisworks.

C. The coordination drawings shall include the following:
   1. Plan view of ductwork showing coordination with light fixtures, cable tray, hydronic piping, major plumbing mains, fire protection piping, structure, bulkheads, actual outside dimensions of ductwork heights, and widths of masonry openings.
   2. Elevations/sections of stacked/overlapped ductwork showing ceiling heights, structures, etc.
   3. Elevations/sections of exposed ductwork showing mounting heights and diffuser layout/types.
   4. Layout and elevation of air handling unit areas.
   5. Layout and elevation of main mechanical unit areas.

3.07 MAINTENANCE AND OPERATING MANUALS AND INSTRUCTIONS

A. Comply with Section 01 7800 and the following:

B. Bind the written operating instructions, shop drawings, equipment catalog cuts, and manufacturer's instructions into the binder with each section separated by tabbed dividers. Material to be assembled as follows:
   1. First Page --Title of Job, Owner, Address, Date of submittal, Name of Contractor, and Name of Architect/Engineer. Emergency operating instructions and/or list of service organizations (including address and telephone numbers) capable of rendering emergency service on 24 hour calls.
   2. Second page--Index
   3. Sections--Each section shall include a subsection with a tab divider. The tab shall list the contents of the the divided section. There shall be a subsection that contains the following information:
      a. Written list of items requiring service and either state the service needed or refer to the manufacturer's data in the binder that described the proper service.
      b. A copy of the approved shop drawing for all systems, equipment, and components (clearly marked for item furnished).
      c. A copy of each manufacturer's operating instructions with an index at the beginning of the section.

d. A list of equipment used on the job, Contractor's purchase order numbers, supplier's name, and address.

C. Submit electronic sets of final documents in final form. Electronic format shall be PDF's on CD's or USB flash drives.

3.08 RECORD DRAWINGS

A. The Contractor shall keep a running record of each change and deviation from the Drawings. Record shall be kept clean and undamaged upon a set of Drawings used for no other purpose. Upon completion of the Project, the Contractor shall submit to the Architect/Engineer one complete set of drawings which have been corrected to show deviations plus "Project Record Drawing" and the Contractor's letterhead type information. With the submittal shall be 2 sets of prints made from the corrected drawings.
   1. CADD drawing option may be used by Contractor. Disks with specific Drawings are available from Architect/Engineer at a nominal charge. Contact Architect/Engineer for current fee.

B. Record Drawings shall show:
   1. Size, type, and capacity of materials, devices, or pieces of equipment.
   2. Location of devices or pieces of equipment.
   3. Location of diffusers, volume dampers, fire dampers, smoke dampers, and related devices of the building systems.
   4. Routing of piping (above and below grade), ductwork, or other building services.

C. These drawings shall also record the location of concealed ductwork and piping by indication of measured dimensions to each such line from readily identifiable and accessible walls or corners of the building.

D. Record drawings must be complete and accurate with regard to concealed piping, ductwork, like equipment, or devices. Unless record drawings are sufficiently accurate to permit immediate location and identification of concealed work with a minimum of cutting, record drawings will be considered inadequate and the contract work deemed incomplete.

END OF SECTION 23 05 01

SECTION 23 05 53
HVAC IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

1.02 RELATED REQUIREMENTS

A. Refer to Section 01 1200 - Multiple Contract Summary for Work under other contracts.

B. Section 09 91 23 - Interior Painting: Identification painting.

C. Section 23 2113 - Hydronic Piping

D. Section 23 3100 - HVAC Ducts and Casings

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

D. Brimar, Inc.

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.

2.03 TAGS

A. Metal Tags: Brass with Engraved letters; letters to be filled with black ink; tag size minimum 1-1/2 inch diameter with smooth edges.

B. Each valve shall have identifying letter(s) designating the sytem and an identifying sequential number designating the unit, such CW-# for cold water lines and HW-# for hot water lines. Identifying letters for piping systems shall be as follows:

1. HHS - Heating Water Supply
2. HHR - Heating Water Return
3. CHWS - Chilled Water Supply
4. CHWR - Chilled Water Return
5. HPWS - Heat Pump Water Supply
6. HPWR - Heat Pump Water Return
7. REFRIGERANT - Refrigerant

C. Chart: Typewritten letter size list in anodized aluminum frame. Five copies (or sets) of valve tag charts of valves shall be furnished by each respective Contractor; said charts shall include the following items:
1. Valve Identification
2. Room Location (Owner Room Number)
3. Room Location (Drawing Room Number)
4. Purpose

D. Mount one set of valve tag charts in an anodized aluminum frame with plastic and secured on a wall in the mechanical room or as otherwise directed. Second set of charts to be prepared for "trouble shooting". The third, fourth, and fifth charts shall be bound into the operating and maintenance manuals.

2.04 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
4. Ductwork and Equipment: 2-1/2 inch high letters.

B. Stencil Paint: As specified in Section 09 91 23, semi-gloss enamel, colors complying with ASME A13.1.

2.05 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.06 DUCT MARKERS

A. Provide pressure sensitive vinyl labels on all ductwork mains installed on this project to identify the basic content, directional flow, and corresponding equipment (i.e. "AHU-B201", "EF-B201", etc.) of the duct. Utilize manufacturer's standard legends such as: Exhaust, Exhaust Air, Intake, Intake Air, Outside Air, Relief, Relief Air, Return Air or Supply Air.

2.07 CEILING TAGS

A. Description: 3/4 inch diameter colored, pressure-sensitive adhesive paper circles. Apply circles to ceiling grid below location of system equipment per following code.

B. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Fire Dampers and Smoke Dampers: Red.
   3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 91 23 for stencil painting.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 91 23.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Identify air handling units, pumps, heat pumps, heat transfer equipment, boilers, chillers, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

H. Identify control panels and major control components outside panels with plastic nameplates or aluminum nameplates.

I. Identify airflow monitoring stations, carbon dioxide sensors, air temperature sensors, and other measuring devices used by the BAS. Tag name shall match the nomenclature used on the drawings and the computer graphics.

J. Identify valves in main and branch piping with tags.

K. Identify air terminal units and radiator valves with numbered tags.

L. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction, and insure there is at least one marker per pipe in every room.

M. Install ductwork with stencilled painting. Identify Air Handling Unit Tag the ductwork is connected to, type of ductwork (ie supply, exhaust, return), and direction of flow. Label a minimum of every 20 feet. Ductwork downstream of VRV fan coil units and VAV fan coil units is not required to be tagged.

N. Provide ceiling tags to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

O. Identify variable frequency drives with plastic nameplate denoting the piece of equipment it is operating.

END OF SECTION 23 05 53

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic and refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

D. Sound measurement of equipment operating conditions.

E. Vibration measurement of equipment operating conditions.

F. Commissioning activities.

1.02 RELATED REQUIREMENTS

A. Section 01450 Quality Control and 01451 Testing Laboratory Services.

B. Section 01 43 00 - Quality Assurance: Employment of testing agency and payment for services.

C. Commissioning
   1. Section 01 9113 - General Commissioning Requirements
   2. Section 01 9114 - Commissioning Authority Responsibility

1.03 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. AABC MN-1 - National Standard for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems; Associated Air Balance Council; 2002.

C. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

D. NEBB (TAB) - Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems; 2019, with Errata (2022).

E. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Architect.
   2. Submit to the Commissioning Authority.
   3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   4. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Field Logs: Submit at least once a week to Commissioning Authority and Garmann/Miller and Associates.

D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

E. Draft "Pencil Copy" Report: Provide draft air balance report when the balancing is complete to the Engineer and Commissioning Authority for review before final report.

F. Commissioning Verification Report: Commissioning Authority will randomly verify TAB work and produce report. TAB Contractor shall make corrections based on this report.

G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Submit under provisions of Section 01 43 00.
   2. Revise TAB plan to reflect actual procedures and submit as part of final report.
   3. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
   4. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   5. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
   6. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   7. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   8. Units of Measure: Report data in I-P (inch-pound) units only.
   9. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.
   10. Test Reports: Indicate data on AABC MN-1 forms, forms prepared following ASHRAE Std 111, NEBB forms, or forms containing information indicated in Schedules.
   11. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name.
      e. Project location.
      f. Project Engineer: Garmann/Miller Architects-Engineers.
      g. Project Contractor.
      h. Project altitude.
      i. Report date.

H. Seasonal Testing: If initial TAB procedures were not performed during near peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near peak summer or winter conditions.

I. 11 month Warranty Walk: TAB to perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to report unusual conditions with recommendation of adjustments. TAB Contractor shall allow two (2) days for this work.

J. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting and balance dampers, control dampers, etc.

1.05 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC MN-1, ASHRAE Std 111, or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
   1. Maintain one copy of each document on site.

B. TAB Agency Qualifications: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years experience certified by AABC.

1.06 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

1.07 WARRANTY

A. Furnish AABC National Performance Guaranty for this project.

PART 3 EXECUTION

2.01 GENERAL REQUIREMENTS

A. The TAB contractor to be hired by the Division 23 mechanical contractor.

B. The Division 23 mechanical contractor shall be responsible to coordinate equipment startup and and any required equipment adjustments/modifications during balancing with the TAB contractor. All this associated time and materials shall be provided by the Division 23 contractor at no additional cost to the project. The TAB contractor will be contracted through the A/E.

C. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
   3. SMACNA (TAB).
   4. Maintain at least one copy of the standard to be used at project site at all times.

D. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

E. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

F. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

G. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

2.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.

4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire, smoke and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of conditions.

2.03 PREPARATION

A. Provide additional balancing devices as required.

2.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

2.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

G. Seasonal Testing: If initial TAB procedures were not performed during near peak summer and winter conditions, perform additional testing, inspecting and adjusting during near peak summer or winter conditions.

H. 10 Month Warranty Walk: TAB to perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to report unusual conditions with recommendation of adjustments. TAB Contractor shall allow two days for this work.

2.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. For variable speed fans, fans and motor pulleys shall be adjusted or replaced if required so that the motor is fully loaded at 100% speed. Balance to design airflow by adjusting maximum variable speed drive output below 100%.

N. Balancer is required to coordinate the developed air system static pressure setpoints with the temperature control contractor.

2.07 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Permanently mark settings of valves, dampers, and other adjustment devices allowing setting to be restored. Set and lock memory stops.

E. Effect system balance with automatic control valves fully open to heat transfer elements.

F. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

G. Pumps with variable speed drives (VFD) shall be balanced with all manual and control valves at 100% open. Triple duty valves shall be left at 100% open for all pumps with VFD's. The triple duty valve shall not be used for balancing VFD systems.

H. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

I. Systems installed with pressure independent control valves shall not require terminal level hydronic system balancing at equipment with the pressure indepedent valves. Field verify installation and operating differential pressure range of all pressure independent control valves. Total system flow shall be verified to be within +/-10% of system design. 100% of the total installed products shall be checked for individual conformance (clip settings on control valves are correct and match submittal). TAB contractor shall document comformity to the submittal. TAB contractor shall notify the temperature control contractor of any descrepancies. Any individual adjustments for the pressure independent valve assembly (valve and actuator combination) for field conditions shall be performed using the pressure independent control valve manufacturer's documented procedure following the guidelines of the National Environmental Balancing Bureau (NEBB) and the Testing Adjusting Balancing Bureau (TABB)]

J. Balancer is required to coordinate the developed water system differential pressure setpoints with the temperature control contractor.

2.08 COMMISSIONING

A. Perform prerequisites prior to starting commissioning activities.

B. Fill out Prefunctional Checklists for:
   1. Air side systems.
   2. Water side systems.

C. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

D. In the presence of the Commissioning Authority, verify that:
   1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
   2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
   3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

2.09 SCOPE

A. Test, adjust, and balance the following:
   1. HVAC Pumps.
   2. Water to Water Heat Pumps
   3. Variable Refrigerant Volume Equipment.
   4. Computer Room Air Conditioning Units.

5. Air Coils.
6. Terminal Heat Transfer Units.
7. Fans.
8. Air Filters.
9. Air Terminal Units.
10. Air Inlets and Outlets.
11. Energy Recovery Units.

2.10 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

B. V-Belt Drives:
1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

C. Cooling Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Water flow, design and actual.
11. Water pressure drop, design and actual.
12. Entering water temperature, design and actual.
13. Leaving water temperature, design and actual.
14. Air pressure drop, design and actual.

D. Heating Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual.
7. Water pressure drop, design and actual.
8. Entering water temperature, design and actual.

9. Leaving water temperature, design and actual.
10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.
12. Air pressure drop, design and actual.

E. Energy Recovery Wheel:
1. Identification/number
2. Location
3. Service
4. Manufacturer
5. Supply air flow, design and actual
6. Exhaust air flow, design and actual
7. Supply Entering temperature, design and actual
8. Supply leaving air temperature, design and actual
9. Exhaust entering air temperature, design and actual
10. Exhaust leaving air temperature, design and actual
11. Air pressure drop, design and actual

F. Air Moving Equipment:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Sheave Make/Size/Bore.
13. Number of Belts/Make/Size.
14. Fan RPM.

G. Return Air/Outside Air:
1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.
12. Design outside/return air ratio.
13. Actual outside/return air ratio.

H. Exhaust Fans:
1. Location.
2. Manufacturer.

3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Sheave Make/Size/Bore.
10. Number of Belts/Make/Size.
11. Fan RPM.

I. Duct Traverses:
1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

J. Duct Leak Tests:
1. Description of ductwork under test.
2. Duct design operating pressure.
3. Duct design test static pressure.
4. Duct capacity, air flow.
5. Maximum allowable leakage duct capacity times leak factor.
6. Test apparatus:
   a. Blower.
   b. Orifice, tube size.
   c. Orifice size.
   d. Calibrated.
7. Test static pressure.
8. Test orifice differential pressure.
9. Leakage.
10. Identification/location.
11. System.
12. Size.
13. Area.
14. Design velocity.
15. Design air flow.
16. Test velocity.
17. Test air flow.

K. Air Distribution Tests:
1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.

6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

L. Sound Level Reports:
1. Location.
2. Octave bands - equipment off.
3. Octave bands - equipment on.

END OF SECTION 23 05 93

SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Insulation jackets.

1.02 RELATED REQUIREMENTS

A. Commissioning
   1. Section 01 9113 - General Commissioning Requirements
   2. Section 01 9114 - Commissioning Authority Responsibility

B. Section 07 84 00 - Firestopping.

C. Section 23 05 53 - HVAC Identification.

D. Section 23 31 00 - HVAC Ducts and Casings: Glass fiber ducts.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

D. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2012.

E. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2008.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

I. ASTM E 119 (UL 263) - Standard Test Methods for Fire Tests of Building Construction and Materials.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

K. ASHRAE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or ASTM E84.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. Knauf Fiber Glass
   2. Johns Manville Corporation
   3. Owens Corning Corp
   4. CertainTeed Corporation
   5. Manson
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C553; glass fiber flexible, limited combustibility blanket.
   1. 'K' value: 0.27 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Minimum 1.0 PCF Density
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E96/E96M.
   3. Secure with UL listed pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Tie Wire: Annealed steel, 16 gage, 0.0508 inch diameter.

2.03 GLASS FIBER, RIGID

A. Manufacturer:
   1. Knauf Fiber Glass
   2. Johns Manville Corporation
   3. Owens Corning Corp
   4. CertainTeed Corporation; ____
   5. Manson
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C 612; rigid, board.
   1. 'K' Value: 0.27 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Minimum 3.0 PCF Density
   3. Maximum Service Temperature: 450 degrees F.
   4. Maximum Water Vapor Absorption: 5.0 percent.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E96/E96M.

3. Secure with UL listed pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.04 DUCT LINER

A. Manufacturers:
   1. Knauf Insulation; Model Atmospheric Duct Liner
   2. Johns Manville Corporation; Model Linacoustic RC
   3. Owens Corning Corp
   4. CertainTeed Corporation;: www.certainteed.com/#sle.
   5. Manson
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Note: Choose the liner type - Elastomeric Foam or Glass Fiber.

C. Insulation: Non-corrosive, limited combustibility glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer or acrylic polymer.
   1. Fungal Resistance: No growth when tested according to ASTM G21.
   2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
   3. Service Temperature: Up to 250 degrees F.
   4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
   5. Minimum Noise Reduction Coefficients:
      a. 1 inch Thickness: 0.45.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. All insulation shall be applied so that there is no fiberglass exposed to the air stream without filters downstream. All fiberglass insulation, including all exposed edges, shall be coated, or mylar or other suitable material shall be provided between fiberglass and the air stream.

D. Insulate ducts conveying air below ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints except where prohibited by code.

E. Insulate ducts conveying air above ambient temperature:
   1. Provide with standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

F. External Duct Insulation Application:
   1. Provide vapor barrier jacket. Cover with aluminum jacket with seams located on bottom side of horizontal ductwork.

2. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier mastic.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

G. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES

A. Exhaust Ducts Within 10 ft of Exterior Openings and Where Noted on Drawings:
1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.
2. Rigid Glass Fiber Duct Insulation: 1-1/2 inches thick.

B. Exhaust/Relief Ducts Exposed to Outdoor Air:
1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.
2. Rigid Glass Fiber Duct Insulation: 1-1/2 inches thick.

C. Outside Air Intake Ducts:
1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.
2. Rigid Glass Fiber Duct Insulation: 1-1/2 inches thick.

D. Plenums/Air Transfers:
1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.
2. Rigid Glass Fiber Duct Insulation: 1-1/2 inches thick.
3. Flexible Glass Fiber Duct Liner Insulation: 1 inches thick, where denoted on drawings.
4. Rigid Glass Fiber Duct Liner Insulation: 1 inches thick, where denoted on drawings.

E. Supply Ducts in Conditioned Space, Including Return Air Plenums:
1. Flexible Glass Fiber Duct Insulation: 1 inches thick.
2. Rigid Glass Fiber Duct Insulation: 1 inches thick.
3. Flexible Glass Fiber Duct Liner Insulation: 1 inches thick, where noted on the drawings.
4. Rigid Glass Fiber Duct Liner Insulation: 1 inches thick, where noted on the drawings.

F. Supply Ducts in Unconditioned Space:
1. Flexible Glass Fiber Duct Insulation: 2 inches thick.
2. Flexible Glass Fiber Duct Insulation: 2 inches thick.
3. Flexible Glass Fiber Duct Liner Insulation: 2 inches thick, where noted on the drawings.
4. Rigid Glass Fiber Duct Liner Insulation: 2 inches thick, where noted on the drawings.

G. Supply and Return Ducts in Attic Space Above Insulation:
1. Flexible Glass Fiber Duct Insulation: 4 inches thick.
2. Rigid Glass Fiber Duct Insulation: 3 inches thick.

H. Supply ducts After Terminal Boxes:
1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.
2. Rigid Glass Fiber Duct Insulation: 1-1/2 inches thick.

I. Ducts Exposed to Outdoors:

1. Flexible Glass Fiber Duct Insulation: 4 inches thick.
2. Rigid Glass Fiber Duct Insulation: 4 inches thick.

J. Combustion Air Ducts:
1. Flexible Glass Fiber Duct Insulation: [1-1/2] inches thick.

END OF SECTION 23 07 13

SECTION 23 08 00
HVAC COMMISSIONING

PART 1 - GENERAL

1.01 SUMMARY

A. The Owner has contracted separately with a Commissioning Authority independent from the Architect, Engineer, and Contractors. The Commissioning Authority shall be responsible solely to the Owner and shall act as an agent of the Owner in the quality control of the project. The Commissioning Authority shall, through the Owner, have the authority to direct the Contractors to perform corrective work until final acceptance of the project by the Owner.

B. The purpose of the commissioning is to verify for the Owner that building systems have been designed and installed to meet the Owner's Project Requirements and operate per the design intent. Commissioning does not eliminate or reduce the responsibility of the design team or contractors to provide a complete and functional facility but is rather to ensure an effective transition from the construction team to the Owner.

C. Specifications have been included to define contractors' responsibilities. It is expected that each contractor participates in the commissioning process, and it is the responsibility of each contractor to provide adequate personnel to do so

1.02 RELATED DOCUMENTS

A. Section 01 91 13 – General Requirements – Commissioning

PART 2 - COMMISSIONING PROCESS

2.01 PRE-FUNCTIONAL TESTING / MANUFACTURER'S STARTUP CHECKLIST

A. The Commissioning Authority will provide pre-functional checklists. The installing contractor will complete the Pre-Functional Checklists and Manufacturer's Start-Up Checklists for each piece of equipment prior to functional testing.

B. Start-up of major HVAC Equipment may be witnessed by the Commissioning Authority. The contractor shall provide the Commissioning Authority a minimum of 72 hours' notice prior to equipment start-up. The appropriate contractors and/or manufacturer's representative will be required on site to perform start-up. Start-up will be performed according to the Manufacturer's recommended procedures.

C. The equipment manufacturers' start-up report for the boiler(s) and chiller(s) shall be completed and provided to the Commissioning Authority. Additional startup reports shall be submitted upon request.

2.02 FUNCTIONAL TESTING

A. The Commissioning Authority will perform or witness the installing contractor or manufacturer's representative performing Functional Testing.

B. Each major system will be tested, and a random sample of each subsystem will be tested.

2.03 MASTER ISSUES LOG

A. Deficiencies noted during the commissioning process shall be documented in the Master Issues Log.

B. Contractors will be responsible for correcting deficiencies and providing written responses to the Commissioning Authority describing the date and method of resolution. If the deficiency was not corrected, the contractor shall provide an explanation as to why it was not corrected.

C. Participation in the in the commissioning process is the contractors' responsibility. Unresolved issues or a failure to provide responses to the Master Issues Log may be considered during the pay application approval process.

D. Status will be tracked for each deficiency and the Master Issues Log will be updated accordingly.

E. The Commissioning Authority will perform limited rechecks of discrepancies after written notification has been received from the contractor that corrections are complete. The cost of subsequent rechecks, if necessary, will be charged directly to the contractor at the hourly rate of the Commissioning Authority.

PART 3 - EXECUTION

3.01 RESPONSIBILITIES OF MECHANICAL CONTRACTOR AND TEMPERATURE CONTROL CONTRACTOR

A. The Contractor shall provide the Commissioning Authority assistance as necessary to gain access to the construction site for the purpose of verifying that the installation of materials and equipment is performed in accordance with the contract documents. This shall include the use of keys, ladders, power lifts and other specialized equipment where necessary.

B. Assure participation of major equipment manufacturers in appropriate startup, training, and testing activities.

C. Participate in commissioning specific meetings scheduled by the Commissioning Authority or Construction Manager.

D. Complete pre-functional checklist for Commissioning Authority review.

E. Assist the Commissioning Authority as necessary during functional testing.

F. Provide owner training per the project specifications.

G. It is the specific responsibility of each contractor to complete all equipment setup, testing, calibration, loop tuning, and related functions prior to Commissioning. The Contractor shall complete all required checklists and certify in writing that these tasks have been accomplished and that the systems are ready for commissioning.

H. The Mechanical and Controls Contractor shall assist the Commissioning Authority as necessary for the purpose of verifying performance of the HVAC and Automatic Temperature Control systems. The Contractor shall assist in the demonstration of the operation of all pieces of equipment throughout the equipment performance ranges, demonstrate all operating and control functions, safety devices, and other appurtenances as requested by the Commissioning Authority during the period scheduled for commissioning of the systems

and equipment. The Contractors shall tune, repair, replace, calibrate, or otherwise modify all equipment that fails to meet the performance required by the contract documents as directed by the Commissioning Authority at no additional cost to the School District.

I. Software and hardware for Commissioning Authority access to BAS Control System:

1. The Automatic Temperature Control Contractor shall provide the Commissioning Authority full access to the Direct Digital Control (DDC) System software and hardware. The contractor shall provide the Commissioning Authority with a complete set of keys, and a copy of all software, along with sufficient training to allow the Commissioning Authority to enter the programs at the highest level of password and to perform the functional testing unassisted. The contractor shall load the software on a Portable Computer provided by the Commissioning Authority. The contractor shall provide the Commissioning Authority a copy of all diagnostic and testing software and all necessary LAN interface attachments required to attach the Commissioning Authority's Portable Computer to all of the contractor's field panels or local area network hubs. The contractor shall make available the necessary software and hardware to the Commissioning Authority for a period beginning at the start of the installation and ending one year after the date of substantial completion of the project, including all updates as required to be 100% compatible with the installed DDC controls. The Commissioning Authority agrees to sign a licensing or confidentiality agreement; however, the software and hardware shall be provided without additional charge. The software will be deleted from the Commissioning Authority's computer at the end of this one-year period. In lieu of the above requirement, the automatic temperature control contractor may provide a laptop computer with the above required connection cable and software, for the Commissioning Authority's use during the period of on-site functional testing. This laptop computer will be returned at the completion of the functional testing but would be made available to the Commissioning Authority for a period of one year for retesting, opposite season testing, and warranty checks.

J. Remote Access to BAS Controls:

1. The Automatic Temperature Control contractor shall provide a means to access the control system via internet connection. The contractor shall provide the Commissioning Authority with a copy of any software required to access the system at the highest password level from a remote site for the purpose of data acquisition. The remote capabilities shall include the ability to start trend logs, to retrieve trend data, and to convert trend data to Microsoft Excel files for graphic analysis. The Commissioning Authority shall provide internet access and computer at his location for the remote access.

END OF SECTION

SECTION 23 09 13
INSTRUMENTS AND CONTROL ELEMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Control panels.

B. Transmitters:

C. Transmitters

D. Meters

E. Building Automation System

F. Building Automation Equipment

G. Temperature Control Wiring

H. Miscellaneous accessories.

1.02 RELATED REQUIREMENTS

A. Section 23 0548 - Vibration and Seismic Controls.

B. Section 23 0519 - Meters and Gages: Thermometer sockets, gage taps.

C. Section 23 05 19 - Meters and Gages: Thermometer sockets and gauge taps.

D. Section 23 0553 - HVAC Identification

E. Section 23 21 13 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, and gauge taps.

F. Section 23 33 00 - Air Duct Accessories: Installation of automatic dampers.

1.03 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2012.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

C. ASHRAE Standard 135-2008 BACnet Protocol.

D. ASHRAE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Control Diagrams

1. Submit to the Architect/Engineer a complete system diagram, showing control connections and devices and their connection to other equipment, together with a clearly written description of the system and an outline of its function under conditions of operation.
2. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
3. Submittals shall be prepared on, or folded to, 8-1/2 inch by 11 inch size and bound in brochure form. Electronic form, pdf format, shall also be included.
4. DDC logic and control diagrams shall be included for all equipment and sequences of control. Include at a minimum all points shown on DDC control drawings. If any additional points are required to complete the sequence of operation, the control equipment needed to provide this information shall be provided.

5. Upon completion of the Work, provide the complete, accurate, and approved diagrammatic blueprinted layouts on the automatic control system specified herein and as installed. Layouts shall show all control equipment including job installation changes, and the function of each system shall be indicated. Layouts and descriptions shall be included in the project record set and in the operating and maintenance manuals.

C. Begin no work until submittals have been approved for conformity with design intent. Provide drawings as flash memory. When manufacturer's cutsheets apply to a product series rather than a specific product, clearly indicate applicable data by highlighting or by other means. Clearly reference covered specification and drawing on each submittal. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work. Provide submittals within 12 weeks after contract award.

D. 100% completed points lists and sequences shall be submitted no later than the point at which system installation is 50% completed.

E. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module including, but not limited to the following equipment and components indicating arrangements, capabilities, range, voltage, horsepower, and construction.
   1. Valves
   2. Thermostats
   3. Relays
   4. Panels
   5. Gauges
   6. Sensors
   7. Dampers
   8. Switches
   9. Pressure Controllers
   10. DDC microprocessor
   11. Unitary DDC controllers
   12. Actuators
   13. Blade Server (Supervisory Controller)
   14. Laptop Workstation
   15. Wiring

F. Wiring diagrams and layouts for each control panel.

G. Floor plan schematic diagrams indicating field sensor, controller and power supply locations.

H. Provide information noting items utilizing BACnet technology are BTL certified and listed.

I. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.
   2. After drawings are finalized, provide drawings in pdf format. Include a list of all unit default safety and control settings, whether fixed or adjustable, as shipped from the factory. Where field modifications are required to meet the specification, provide all modification labor and materials, and submit a complete, detailed, step-by-step procedure for modifications.
   3. Drawings shall also be installed in workstation as web pages.

J. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

1. As-built versions of the submittal product data.
2. Names, addresses, and 24-hour telephone numbers of installing contractors and service representatives for equipment and control systems.
3. Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point/object reports, trending data, overriding computer control, and changing setpoints and variables.
4. Programming manual or set of manuals with description of the programming language and syntax of statements for algorithms and calculations used of point/object database creation and modification, of program creation and modification, and editor use.
5. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points/objects, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
6. Documentation of all programs created using custom programming language including setpoints, tuning parameters, and object database.
7. Graphic files, programs and database on magnetic or optical media.
8. List of recommended spare parts with part numbers and suppliers.
9. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware, including computer equipment and sensors.
10. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
11. Licenses, guarantee, and warranty documents for equipment and systems.
12. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
13. Operation & Maintenance manuals shall also be installed in workstation as web pages.

K. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

L. After the control submittal has been reviewed and marked "No Exceptions Taken" by the design engineer, the controls contractor shall submit all graphics required for the temperature control system. The graphics shall be reviewed by the owner, commissioning agent, and the design engineer. The temperature control contractor shall not install any graphics until they have been reviewed and approved by the owner, commissioning agent and design engineer.

1.05 SUMMARY

A. General: The control system shall be as indicated on the drawings and described in the specifications.

B. **Base Bid:** The control system for the new athletic complex can be stand alone system, independent of the districts other buildings. The installed system must comply with all other portions of this specification.

C. **Alternate Bid #8:** The control system for the new athletic complex can shall be integrated into the district's existing BAS system for the other buildings, for a unified front end. The current BAS system is Facilities Explorer, maintained by ChillTex.

D.

1. ANSI/ASHRAE Standard 135 BACnet - A Data Communication Protocol for Building Automation and Control Networks
2. ANSI/TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard

E. The Direct Digital Control System (DDC) shall be based on a Tridium Niagra N4 framework. Provide an open automation infrastructure that integrates diverse systems and devices

(regardless of manufacturer, communication standard or software) into a unified platform that can be easily managed in real time over the internet using a standard web browser.

F. It is the Owner's express goal to implement an open system that will allow products from various suppliers to be integrated into to a unified system in order to provide flexibility for expansion, maintenance, and service of the system. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the Owner shall receive ownership of all job specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the JACE, N4 Supervisor, and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required IDs and passwords for access to any component or software program shall be provided to the Owner. The Owner shall determine which organizations to be named in the SI organization ID ("orgid") of all software licenses. Owner shall be free to direct the modification of the "orgid" in any software license, regardless of supplier, by Tridium Inc.

G. The Network Controller (NWC) shall connect to the Owner's local or wide area network, depending on configuration. Access to the system, either locally in each building, or remotely shall be accomplished through standard Web browsers and/or the N4 Supervisor, via the Internet and/or local area network.

H. Each NWC shall communicate to BACnet (B-AAC, B-ASC), devices and/or other open protocol systems/devices as described on the contract drawings and/or in the specifications.

I. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of mechanical systems for Owner.

J. The control system shall accommodate a minimum 8 simultaneous multiple user operation utilizing standard web-browser clients. Access to the control system data should be limited only by user ID and operator password. Multiple users shall have access to all valid system data. An operator shall be able to log onto any work-station on the school's network and have access to all appropriate data. All users shall have an unique ID and password. Owner shall provide user information and permission levels ninty days prior to scheduled completion.

K. The control system shall be designed such that each mechanical system will be able to operate under stand-alone control. As such, in the event of a network communication failure, the loss of any other controller, or the school district network, the control system shall continue to independently operate under control.

L. Communication between the control panels and all work-stations shall be over a high speed 100 Mpbs (at minimum) Ethernet network. All nodes on this network shall be peers. The operator shall not have to know the panel identifier or location to view or control an object. Application Specific Controllers shall be constantly scanned by the network controllers to update point information and alarm information.
   1. The communication network wiring between control panels, and equipment controls with BACnet communication cards (chiller control panel, boiler control panels, domestic water heaters, and VFD's) shall be provided and installed by the temperature control contractor. The use of the owner's network for communication between devices shall be prohibited. Provide a single point of communication between the owner's network and the DDC control system network.

M. Temperature control contractor shall be responsible for the following:
   1. The DDC System shall communicate to the owner's communication network thru a single point of data connection. All wiring and communication downstream of that single point of data connection shall be provided with the DDC control system.
   2. Providing of a complete DDC electronic automatic temperature control system.

3. Control of rooftop air handling units along with other miscellaneous equipment as denoted on drawings in accordance with requirements herein specified.
4. Providing of control devices, valves, instruments, and the like, as herein specified and as required to comply with required sequences of automatic control.
5. Providing of wiring for secondary control devices, relay switches, safety low limit controls, etc., and such interlock wiring required.
6. Provide all control wiring between all primary network controllers and equipment furnished with Bacnet control panels. Provide a single point connection to owner's LAN.
7. Coordinate communication requirements for the air handling units controls that are provided by the air handling unit manufacturer.
8. Tag all automatic controls, instruments, safeties, panels, actuators and relays. Key to control schematic. Refer to specification 23 0553 - HVAC Identification
9. Furnish adequate supervision on Work performed for him by others to insure proper operation and the neatest and best possible arrangement.
10. Testing and maintenance of system as herein specified.

N. The documentation is schematic in nature. The Contractor shall provide hardware and software necessary to implement the functions and sequences shown.

1.06 QUALITY ASSURANCE

A. The temperature control contractor shall furnish and install a fully integrated building automation system, incorporating direct digital control (DDC) for energy management, equipment monitoring and control, and subsystems as herein specified. The installation of the control system shall be performed by an authorized dealer of the controls manufacturer with the shop drawings, flow diagrams, bill of materials, component designation or identification number, and sequence of operation all bearing the name of the manufacturer.

B. All materials and equipment used shall be standard components, regularly manufactured for the specified system. All systems and components shall have been thoroughly tested and proven in actual use of at least 2 years.

C. The temperature control contractor shall read all other Drawings and Specifications, become familiar with requirements and scope of the Project, and include such coordination work as may be required.

D. Designer Qualifications: Design system under direct supervision of a Control Engineer experienced in design of this work and is certified by control system manufacturer.

E. Installer Qualifications
1. Installing contractor shall have an established working relationship with control system manufacturer of not less than 5 years.
2. Installing contractor and his sub-contractors shall have successfully completed manufacturer's control system training. Provide certification of completed training, including hours of instruction and course outlines, with bid.
3. Installing contractor shall have an office within 75 miles of the project site and provide 24 hours response in the event of a customer call, 7 days per week, 365 days per year.

F. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., UL-916 Energy Managment Systems, UL-864UUKL Smoke Systems as suitable for the purpose specified and indicated and shall comply with NFPA 70.

G. Systems utilizing BACnet technology shall be BTL certified and comply with ASNI/ASHRAE Standard 135, BACnet - A Data Communication Protocol for building Automation and control networks.

H. Systems utilizing Lonworks shall not be permitted.

I. Damper components shall meet the requirements of AMCA 500.

J. Control systems shall meet the requirements of ASHRAE Standard 90.1.

K. Performance Standards. System shall conform to the following minimum standards over network connections:
   1. Graphic Display. A graphic with 20 dynamic points/objects shall display with current data within 10 seconds.
   2. Graphic Refresh. A graphic with 20 dynamic points/objects shall update with current data within 8 seconds.
   3. Object Command. Devices shall react to command of a binary object within 2 seconds. Devices shall begin reacting to command of an analog object within 2 seconds.
   4. Object Scan. Data used or displayed at a controller or workstation shall have been current within the previous 6 seconds.
   5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 45 seconds
   6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 second. Select execution times consistent with the mechanical process under control.
   7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per second. Select execution times consistent with the mechanical process under control.
   8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 seconds of other workstations.

1.07 CONTRACTOR RESPONSIBILITIES

A. The temperature control contractor shall be responsible for final design drawings, installation of all control wiring and control devices in accordance with National Electric Code. The temperature control contractor shall also be responsible for startup and complete checkout, and commissioning of the systems.

B. This Contractor shall furnish complete drawings, component lists, specification sheets and sequences of operation to the Architect/Engineer for approval before start of installation.

C. All DDC logic diagrams shall be updated as built and included in the Operation and Maintenance Manuals for the Owner.

D. The temperature control contractor is responsible to use all room numbers developed and approved by the owner in the development of the temperature control system for this building.

E. The temperature Control Contractor shall provide labeling for all control system sensors, panels, actuators, etc. The label names shall match the point names given on the computer and as shown on the temperature control drawings.

F. The temperature control contractor shall contact the rooftop unit manufacturer to integrate the cotnrol and monitoring points specified in the sequence of operations. The connection to the controller shall be thru BACnet/IP, BACnet MS/TP.

G. The temperature control contractor shall be responsible to provide low voltage Power Supplies for opeation of system as required. Temperature Control contractor shall be responsible to provide low voltage wiring from power supplies to controllers. Submit wiring diagram as part of temperature control submittal.

1.08 SOFTWARE LICENSE AGREEMENT

A. The owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to the owner as defined by the manufacturer's license agreement, but shall

protect manufacturer's rights to disclosure of trade secrets contained within such software. The owner shall receive a copy or multiple copies licensed to them of any local programming tool required to replace or program local controller.

B. It is the owner's goal to implement an open system that will allow products from various suppliers to be integrated into an unified system in order to provide flexibility for expansion, maintenance, and service of the system.

C. OPEN NIC STATEMENT: All Niagra 4 software licenses shall have the following NiCS: "accept.station.in=*"; "accept.station.out=*"; "accept.wb.in=*"; "accept.wb.out=*". All open NIC statments shall follow Niagra Open NIC specifications.

D. The owner shall be named license holder of all software associated with any and all incremental work on the project(s). The owner shall receive a copy or multiple copies licensed to them of any local programming tool required to replace or program local controller.

E. In addition, the owner shall receive ownership of all job-specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job-specific software code and documentation for all configuration and programming that is generated for a given project.

F. The owner shall be provided with all usernames and passwords required from complete and unlimited access to the system.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period following owner acceptance of entire building.

C. Warranty shall also include any software upgrades available during the one (1) year period.

D. Temperature control contractor shall provide support for operation of the system and improvements to energy usage to the owner throughout the first two years of operation after the date of substantial completion.

1.10 MAINTENANCE SERVICE

A. Provide service and maintenance of control system for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The design intent is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate both the ANSI/ASHRAE Standard 135-2008 BACnet protocol in one open, interoperable system. System shall be capable for future extension by other manufacturer's and shall not be write-protected.

B. Control Manufacturers (Certified by BACnet testing laboratory):
   1. Tridium Niagara 4 Vykon - JACE 8000
   2. Schneider Electric - TAC I/A Series Micronet / MNB Bacnet Controllers
   3. Alerton Controls - VAV and VLC Series Bacnet Controllers
   4. Honeywell - Spyder PUB / PVB Series Bacnet Controllers, WEB-8000 Supervisory.
   5. Johnson Controls - METASYS FEC / IOM / Series Bacnet Controllers. FX-90 Supervisory
   6. Distech - ECY / ECB controllers; by prequalified contractor.
   7. Trane Controls - UC210 / UC400 / UC600 Bacnet Controllers.

C. The following Installing Contractors are prequalified:
   1. ChillTex
   2. Waibel Energy Systems, Building Logix

3. Smith Boughan, Inc
4. Wadsworth Solutions, Inc
5. Point to Point Systems

D. Substitutions: See Section 01 60 00 - Product Requirements.

E. All temperature control systems shall be installed by the factory authorized installer or representative serving the Ohio, OH Area.

2.02 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.03 CONTROL PANELS

A. Control cabinet/enclosure shall be extruded aluminum, galvanized steel or factory-hardened plastic with key locks and hinged doors. Electric panels shall be of code gauge steel construction with UL label. Panels shall be labeled with nameplates and legends as required.
   1. The control cabinet/enclosure shall be required to house devices not enclosed as a part of the DDC building automation system panels. Prewire with internal wiring terminated at labeled terminal strips. Thermometers and switches shall be mounted on the cover of the panel. Relays, transformers, and components shall be mounted inside the panel. Devices, whether interior or exterior, shall be provided with legend plates of engraved formica or equal. Cabinets shall be located as approved by the Architect/Engineer or as indicated on the Drawings.
   2. Local type panels need not contain graphic representations or symbols, unless specified below, but must contain approved nameplates, legends, etc., for each device.
   3. Where panels contain any wiring, panels shall be UL approved cubicles.

B. Provide common keying for all panels.

2.04 TRANSMITTERS

A. Electronic Temperature Sensors
   1. Provide temperature sensors and other temperature indicating sensors of commercial grade quality located at the point of measurement and installed according to the manufacturer's recommendations. Sensors to be vibration and corrosion resistant.
   2. Thermistor temperature accuracy shall be +/-0.36 F between the range of 32.0 - 158.0 F.
   3. Provide temperature sensors such that the BAS shall be able to convert the resistive input signal available from the element into a digital signal for use by the BAS.
   4. Provide outside air temperature sensors with a watertight fitting and adequate protection from the effects of solar radiation.
   5. Provide water temperature sensors of the bulb type, mounted within stainless steel wells filled with a heat conductive compound and in direct contact with the water within the pipe.
   6. All field mounted sensors shall be labeled as to their function and name used in the control program.

B. Electronic Room Temperature Sensors
   1. Room Temperature Sensors shall be used in classrooms, office spaces, kitchen spaces, student dining, and gymnasiums.
   2. Temperature sensors shall be equal to PreCon type-IV thermistors utilizing a 20K ohm thermistor or platinum RTD's of 2000 ohm resistance.
   3. Housing: Sensors shall be manufactured in a durable epoxy housing and shall be enclosed for protection from elements when installed in the sensors operating environment. The sensor cover shall be provided with tamperproof screws. Sensors shall not include a display or keypad.

4. Temperature sensors shall be provided with an override button that will switch the mechanical system into occupied mode of control. Other than the override button the thermostat face shall be blank, with no temperature adjustment, readout panels, etc.
5. Sensor cover shall be color "Pure White".

C. Humidity Sensors
1. Shall be a "Current Type" humidity transducer. Sensor shall produce a linear 4-20mA current representing the span of the sensor. This signal shall be produced by the sensor itself through a current converter supplied with the sensor.
2. Space humidity sensor shall be enclosed in a durable enclosure for mounting in interior zones. Sensor shall have a range of 0 to 100 percent relative humidity and shall be accurate with + 2 percent of span.
3. Duct humidity sensor shall be a probe type with all wiring enclosed in an electrical box. Sensor shall have a range of 0 to 100 percent with an accuracy of + 3 percent of span.
4. Outdoor humidity sensor shall be enclosed in a weather proof enclosure for mounting outdoors. Sensor shall have a range of 0 to 100 percent with an accuracy of +/- 3 percent of span.

D. Carbon Dioxide Sensors
1. Sensor type shall be Non-dispersive infrared (NDIR), diffusion sampling with a measurement range from 0-2000 PPM.
2. Minimum Accuracy: +/- 75 PPM of calibrated span.
3. Input Voltage: 20 to 30 VAC/DC; 100 mA max.
4. Analog Output: 0-5 VDC, 0-10 VAC or 4-20 mA user selectable.
5. Sensor shall have self-calibrating capabilities.
6. Sensor shall have capability of sensing an alarm to the BAS in the event of a calibration problem or malfunction.
7. At the time of Project Completion, the TCC shall verify the calibration of all CO2 sensors.
8. TCC to verify with sensor manufacturer the best signal wiring to be used to prevent signal irregulatities and errors.

E. Current Status Switch
1. Shall be capable of detecting changes in flow of current to motors in determining accurate and reliable equipment status.
2. Ampere rating for 2.5 - 135 amps continuous.
3. Sensor supply voltage shall be included from monitor conductor.
4. Minimum current required is 1 amp.
5. Trip setpoint shall be adjustable to +/- 1 percent of range.

2.05 BUILDING AUTOMATION SYSTEM

A. Furnish a complete Direct Digital Control system.
1. The entire system shall be totally DDC with electric/electronic actuation. No pneumatics shall be utilized except where noted on the associated drawings.
2. The DDC System shall support the ASHRAE Standard 135-1995 BACnet protocol.
3. The DDC System shall communicate to the owner's communication network thru a single point of data connection. All wiring and communication downstream of that single point of data connection shall be provided with the DDC control system.
4. The Local Area Network shall be a 100 Mpbs Ethernet network.
5. The system shall be backward compatible. Whenever a system upgrade is provided, the system shall be capable of communicating to existing device level controllers without the requirement to provide any new equipment and controllers.
6. The system shall be capable of operating on the latest version of IE explorer, Firefox, or Google Chrome. System shall be capable of operating without JAVA.

B. The following HVAC equipment shall be controlled by the Building Automation System including sequences. A graphic shall be provided for each piece of equipment listed below:
   1. Rooftop Air Handling Units
   2. Energy Recovery Unit

C. Operator Workstation
   1. Data Network Equipment Contractor to furnish a dedicated virtualized server to host web services and storage for temperature control use at minimum (1 TB) partition. Temperature Control Contractor shall be responsible to coordinate with Data Network Equipment Contractor and the owner's representative on requirements for server. Temperature Control Contractor to coordinate with Data Network Equipment Contractor for server resource requirements. Data Network Equipment Contractor to provide Microsoft Operating System only. Temperature Control Contractor to provide all necessary programming, additional licensing, and software required for a fully functional system.
   2. A laptop computer shall be provided as part of this project. This contractor shall install network server software on the laptop as part of this project to allow interface with this project. Provide any additional cables necessary to connect to any of the controllers on the system. The laptop shall be made available to the commissioning agent for their use as well.
      a. Critical alarms shall be reported to the laptop, cell phones, and email accounts of the maintenance department employees. All critical alarms shall be wired so that unit fans, pumps, etc. cannot be turned on in hand mode when safety device is tripped.
      b. The laptop computer shall include the ability to access the temperature control system via the owners network. User interface shall be seamless and the user shall be capable of performing all functions that can be performed locally.
   3. The computer designated shall be used for command entry, information management, network alarm management, and data base management functions. All real-time control functions shall be resident in the standalone DDC panels to facilitate greater fault tolerance and reliability.
      a. The laptop computer shall have a minimum Intel Core i5 processor with a 500.0 GB hard drive, 8 GB Ram, parallel port, serial port, USB port, wireless 802.11 A/G/N network card, an RJ45 10/100/1000 internal network card, and high capacity Lithium Ion battery. The laptop shall include a minimum 15.4" WXGA LCD panel. Furnish Nylon laptop carrying case. Acceptable manufacturers shall be IBM/Lennovo, HP, Dell, and Toshiba. Computer platform shall be certified by DDC system manufacturer. Furnish Microsoft Windows 7 operating system as a minimum.

D. Laptop computer Hardware - Communications
   1. The new personal computers shall provide a minimum of two communication ports, one EIA-232C for local direct connect communications and one for remote dial-up communications. All communication ports shall be bidirectional data communicators.
   2. Storage of software programs and communication logic shall be maintained without battery backed assistance.

E. Server Software
   1. Server software shall take advantage of daily energy management report generation capability of the Global Control Panel (GCP) and all remote DDC controllers. The host computer shall automatically poll direct or remotely connected sites, gather the data, archive it and generate daily, weekly, monthly and yearly summaries as needed.
   2. The host software shall permit acquisition and long term storage of unlimited independent trend logs. Trends shall be operated by the host directly or automatically uploaded from the GCP or remote DDC controllers at user specified intervals. Trend data shall be

graphically represented using a dynamic process graphics report generator in a bar chart or line format including HTML, XML, PlainText, or HTTP formats.

3. Host software will contain alarm and exception processing systems. Events including point alarm, point faults, device diagnostics, maintenance time reminders, actual control programs and log on/off shall be recorded in the system status log. The System Status log shall define automatically generated exception reports based on user selectable criteria such as point type, operator, time and date of occurrence, etc. The program shall prioritize alarms for display with the most critical alarm first. An operator shall also be able to user define individual alarms to interrupt a user and display the system status log.
4. Provide icon selection of users programs such as database programming and monitoring. Provide menus with highlighted active commands, context commands descriptions and help files. A standard mouse interface and normal keyboard operation shall access all programs. Provide continuous display of system status, and text monitoring screens with highlighted alarm conditions and report generation.
5. Any action taken by an operator shall be logged to the systems status log to render an audit trail of operator actions. User access definitions shall be completely definable and modifiable by the system's manager.
6. The Graphical User Interface (GUI) shall run on Microsoft Windows 7 or most recent.
7. The GUI shall employ standard browsers including Windows Explorer and Firefox. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.
8. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:
    a. Minimum Required Graphics:
        1) All setpoints shall be shown on the respected graphic page for each piece of equipment. All setpoints shall be adjustable and acceptable range of adjustment shall be noted in as-built sequence of operation.
        2) Home Screen with background image of school building or school logo and include following:
            (a) Information on current weather conditions
            (b) Link to building floor plan
            (c) Link to each individual air handling unit screen.
            (d) Link to alarms page
            (e) Link to schedules page
            (f) Snow Day Schedule Button.
        3) Floor Plan: Overall floor plan shall be provided with units broke out in different colors. Link to each individual enlarged unit plan. Enlarged Unit plans shall contain:Unit shall Color graphic floor plan and zone floorplans showing all space temperatures, space CO2 levels and humidity levels where indicated on tempeature control drawings.
            (a) Floor plan showing all spaces with room numbers matching owner's final room number designations.
            (b) Temperature of each space. Either space or text shall change color based on deviation away from setpoint. Space or text shall change to blue if room below setpoint by 2 F (adj) and change to red if above 2 F (adj) setpoint. Text to be green for space setpoint met.

(c) Show space humidity at locations of space humidity sensors.
(d) Link back to overall floor plan.
(e) Link to equipment page serving the room by clicking on the individual space.
(f) Link to alarm page.

4) Space Equipment Screen: Screen showing the individual equipment serving the space. Information on screen shall include:
   (a) Graphic of equipment including heating / cooling coils, valves, fans, and dampers. Graphics shall be dynamic.
   (b) Fan operation including fan speed if variable speed.
   (c) Damper Positions.
   (d) Primary airflow value. Also minimum and maximum airflow settings.
   (e) Discharge air temperature.
   (f) Current space temperature, space setpoint, and setback temperature setpoints
   (g) Override button with override temperature
   (h) Current CO2 level (if specified), high and low level CO2 setpoints
   (i) Link to associated air handling unit.
   (j) Link back to overall floor plan screen.
   (k) Link to alarm screen.
5) Air Handling Unit Screen:
   (a) Graphic of equipment including heating / cooling coils, valves, dampers, fans, filters, airflow stations and other sensors. Graphic shall be dynamic
   (b) Fan operation including fan speed if variable speed.
   (c) Provide a link to VFD screen. On VFD screen provide in a table format all information from VFD.
   (d) Damper Positions.
   (e) Energy Recovery wheel status
   (f) Airflow values and temperature values as shown on temperature control drawing schematics.
   (g) If air handling unit is set up as a VAV air handling unit, include the following information:
      (1) Supply air temperature
      (2) Supply air temperature setpoint
      (3) Supply air static pressure
      (4) Supply air fan static pressure setpoint.
   (h) If air handling unit serves a single zone, include the following information on the equipment screen:
      (1) Space Temperature
      (2) Space Temperature setpoint.
      (3) Unoccupied space temperature and humdity setpoints.
      (4) Space Humidity level.
      (5) Space Humidity setpoint.
      (6) Space CO2 level.
      (7) Space CO2 setpoint.
   (i) Filter differential pressure. Include alarm if DP hits high limit.
   (j) Link to associated chilled water plant.
   (k) Link to associated heating water plant.
   (l) Link to sequence of operation page.
   (m) Link to alarm page.

(n) Link back to overall floor plan.

6) Miscellaneous Equipment
   (a) Include status, on/off button where noted in the sequence of operation, space temperature, space temperature setpoint for:
      (1) Electric Duct Heater
      (2) Technology space cooling equipment.

7) Alarms Page
   (a) The system will be provided with a dedicated alarm screen. This screen will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm.
   (b) All critical alarms shall be wired so that unit fans, pumps, etc. cannot be turned on in hand mode when safety device is tripped.
   (c) All critical alarms as determined by the owner shall be sent ot email accounts, cell phones, and pagers via text messaging capabilities.

8) Schedules Page
   (a) Provide calendars for all air handling equipment.

b. The sequence of operations shall be located as a pull down feature at each piece of equipment or provide a link to a pdf document of the sequence of operations.

c. Provide As-Built wiring diagrams complete with material part numbers.

d. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection or text-based commands. Dynamic temperature values, flow values and status indication shall be shown in their actual respective locations and shall automatically update to represent current conditions without operator intervention.

e. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.

f. Graphic screens shall contain objects for text, real-time values, animation, color spectrum objects or “thermo-graphics”, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.

g. Graphics shall support layering and each graphic object shall be configurable for assignment to a layer. A minimum of six layers shall be supported.

h. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.
   1) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
   2) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
   3) Snow Day Operation shall be set by clicking on a "Snow Day" button located on screen of graphics.

i. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

j. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.

9. System Configuration: At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:
   a. Create, delete or modify control strategies.
   b. Add/delete objects to the system.

c. Tune control loops through the adjustment of control loop parameters.
d. Enable or disable control strategies.
e. Generate hard copy records or control strategies on a printer.
f. Select points to be alarmable and define the alarm state.
g. Select points to be trended over a period of time and initiate the recording of values automatically.

10. On-Line Help: Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.
11. Security: Each operator shall be required to log on to that system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.
12. System Diagnostics. The system shall automatically monitor the operation of all workstations, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

2.06 BUILDING AUTOMATION EQUIPMENT

A. System Network Controller (SNC)
1. These controllers are designed to manage communications between the programmable equipment controllers (PEC), application specific controllers (ASC) and advanced unitary controllers (AUC) which are connected to its communications trunks, manage communications between itself and other system network controllers (SNC) and with any operator workstations (OWS) that are part of the BAS, and perform control and operating strategies for the system based on information from any controller connected to the BAS.
2. The controllers shall be fully programmable to meet the unique requirements of the facility it shall control.
3. All devices shall meet the requirements of clause 22.1.5 of ASHRAE 135-2012. Use Analog inputs and outputs. If Analog Output objects are used, these must be writeable.
4. The controllers shall be capable of peer-to-peer communications with other SNC's and with any OWS connected to the BAS, whether the OWS is directly connected, connected via cellular modem or connected via the Internet.
5. The communication protocols utilized for peer-to-peer communications between SNC's will be Niagara 4 Fox, BACnet TCP/IP and SNMP. Use of a proprietary communication protocol for peer-to-peer communications between SNC's is not allowed.
6. The SNC shall employ a device count capacity license model that supports expansion capabilities.
7. The SNC shall be enabled to support and shall be licensed with the following Open protocol drivers (client and server) by default:
   a. BACnet
   b. SNMP
8. The SNC shall be capable of executing application control programs to provide:
   a. Calendar functions.
   b. Scheduling.
   c. Trending.

d. Alarm monitoring and routing.
e. Time synchronization.
f. Integration of BACnet controller data.
g. Network management functions for all SNC, PEC and ASC based devices.

9. The SNC shall provide the following hardware features as a minimum:
   a. Two 10/100 Mbps Ethernet ports.
   b. Two Isolated RS-485 ports with biasing switches.
   c. 1 GB RAM
   d. 4 GB Flash Total Storage / 2 GB User Storage
   e. Wi-Fi (Client or WAP)
   f. USB Flash Drive
   g. High Speed Field Bus Expansion
   h. -20-60°C Ambient Operating Temperature
   i. Integrated 24 VAC/DC Global Power Supply
   j. MicroSD Memory Card Employing Encrypted Safe Boot Technology
10. The SNC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.
11. The SNC shall provide alarm recognition, storage, routing, management and analysis to supplement distributed capabilities of equipment or application specific controllers
12. The SNC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via cellular modem, or wide-area network.
    a. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but not limited to:
       1) Alarm.
       2) Return to normal.
       3) To default.
    b. Alarms shall be annunciated in any of the following manners as defined by the user:
       1) Screen message text.
       2) Email of complete alarm message to multiple recipients.
    c. The following shall be recorded by the SNC for each alarm (at a minimum):
       1) Time and date.
       2) Equipment (air handler #, access way, etc.).
       3) Acknowledge time, date, and user who issued acknowledgement
13. Programming software and all controller "Setup Wizards" shall be embedded into the SNC.
14. The SNC shall support the following security functions.
    a. Module code signing to verify the author of programming tool and confirm that the code has not been altered or corrupted.
    b. Role-Based Access Control (RBAC) for managing user roles and permissions.
    c. Require users to use strong credentials.
    d. Data in Motion and Sensitive Data at Rest be encrypted.
    e. LDAP and Kerberos integration of access management
15. The SNC shall support the following data modeling structures to utilize Search; Hierarchy; Template; and Permission functionality:
    a. Metadata: Descriptive tags to define the structure of properties.
    b. Tagging: Process to apply metadata to components
    c. Tag Dictionary
16. The SNC shall employ template functionality. Templates are a containerized set of configured data tags, graphics, histories, alarms... that are set to be deployed as a unit based upon manufacturer's controller and relationships. All lower level communicating

controllers (PEC, AUC, AVAV, VFD…) shall have an associated template file for reuse on future project additions.

17. The SNC shall be provided with a 5 Year Software Maintenance license. Labor to implement not included.

B. Primary Controllers (Air Handling Units, Chilled Water Plant, and Heating Water Plant)
   1. Each primary controller shall be a dedicated, stand-alone, microprocessor-based DDC controller that is BACnet certified (B-BC / B-AAC) with sufficient capacity to handle all points and programming associated with the control sequences as specified. In addition, each controller shall have a minimum 15% spare point capacity. Primary controllers shall be capable of being mounted within the equipment housing and shall have the capability to be programmed on-line and/or off-line (simulation capability) as required to meet unique HVAC application needs as well as the various ASHRAE control cycles. Primary controllers shall be capable of communicating global and critical variables to other primary controllers residing on the same network without the intervention of a higher level controller (Peer to Peer communication).
   2. All devices shall meet the requirements of clause 22.1.5 of ASHRAE 135-2012. Use Analog inputs and outputs. If Analog Output objects are used, these must be writeable.
   3. All primary controllers shall be application programmable and shall at all times maintain their certification. All control sequences within or programmed into the primary controller shall be stored in non-volatile memory, which is not dependent upon the presence of a battery to be retained.
   4. Software incorporated into the controller shall include the following:
      a. Real time operating system software
      b. Real time clock/calendar and network time synchronization
      c. Primary control unit diagnostic software
      d. LAN/WAN communication software
      e. Alarm processing and buffer software
      f. Energy management software
      g. Data trending, reporting, and buffering software
      h. Input/output database (physical and virtual points)
   5. Primary controller shall have expansion capability to support additional I/O requirements thru remote expansion input/output modules.
   6. The controller shall have a mix of digital inputs (DI), digital Triac outputs (DO), analog outputs (AO), and universal inputs (UI).
      a. Analog outputs (AO) shall be capable of being configured as digital outputs (DO).
      b. Input and Output wiring terminal strips shall be removable from the controller without disconnecting wiring.
      c. Input and Output wiring terminals shall be designated with color coded labels.
      d. Universal inputs shall be capable of being configured as binary inputs, resistive inputs, voltage inputs (0-10 VDC), or current inputs (4-20 mA).
   7. The controller shall provide "continuous" automated loop tuning with an Adaptive Integral Algorithm Control Loop.
   8. An RJ-11 type connection serial port shall allow a local portable operator terminal to access all program blocks and attributes for complete programmability. The port shall also support complete up/downloading capability.
   9. All input/output and control parameters may be utilized or shared throughout the network. All primary controllers shall be accessible throughout the network.

C. Secondary Controllers (VAV units, cabinet heaters, and miscellaneous equipment)
   1. Each secondary controller shall be a stand-alone, microprocessor-based DDC controller that is BACnet certified (B-AAC / B-ASC) with sufficient capacity to handle all points

associated with the control sequences as specified. Secondary controllers shall be capable of being programmed on-line and/or off-line (simulation capability) as required to meet the specific HVAC application needs as well as the various ASHRAE control cycles. Secondary controllers shall be capable of communicating with other secondary controllers through an interface or higher level controller.

2. All devices shall meet the requirements of clause 22.1.5 of ASHRAE 135-2012. Use Analog inputs and outputs. If Analog Output objects are used, these must be writeable.
3. Secondary controllers shall be microprocessor-based, programmable DDC controllers with all operating parameters, setpoints and schedules stored in memory which resides on the controller.
4. Software incorporated into the controller shall include the following:
   a. Real time operating system software
   b. Secondary control unit diagnostic software
   c. LAN/WAN communication software
   d. Control software applicable to the unit it serves that will support one mode of operation
   e. Input/output database (physical and virtual points) to support one mode of operation
5. The controller shall have digital inputs (DI), digital Triac outputs (DO), three analog outputs (AO), and universal inputs (UI).
   a. Analog outputs (AO) shall be capable of being configured as digital outputs (DO).
   b. Input and Output wiring terminal strips shall be removable from the controller without disconnecting wiring.
   c. Input and Output wiring terminals shall be designated with color coded labels.
6. The controller shall provide "continuous" automated loop tuning with an Adaptive Integral Algorithm Control Loop.
7. The controller platform shall have a standard HVAC application program(s) that are modifiable to support both the traditional and specialized "sequence of operations" as outlined in the specification. The controller shall have the capability to communication thru read/write the following:
   a. Reset room setpoint
   b. Read/log/trend room temperature
   c. Override day or night operation
   d. Change maximum heating and cooling CFM flow rates (VAV terminal units)
   e. Change minimum heating and cooling CFM flow rates (VAV terminal units)
   f. Read CFM flow rate at each terminal (VAV terminal units)
   g. Read the discharge air temperature at each terminal unit
   h. Room CO2 control.
   i. Assign daily occupied/unoccupied times
   j. Read terminal type i.e. fan powered, reheat, etc.
8. Should communications to the secondary controller fail in any manner, the controller will have its configuration in non volatile memory and shall maintain room setpoint.

2.07 TEMPERATURE CONTROL WIRING

A. The DDC System shall communicate to the owner's communication network thru a single point of data connection. All wiring and communication downstream of that single point of data connection shall be provided with the DDC control system.

B. Control wiring shall meet the requirements of Article 725, Class 1, Class 2, Class 3 Remote-Control, signaling, and power-limited circuits of the NEC.

C. Control wiring shall be UL listed plenum rated cable or installed in conduit. Wiring shall be routed in conduit where exposed to occupied spaces and in mechanical rooms. Conduit shall

be 1/2 inch minimum size and shall be furnished and installed under this section. Exposed wiring in occupied spaces and mechanical rooms will not be accepted.

D. Concealed wiring and wiring in non-plenum ceiling cavities, which is operating under 100 volts, may be open wired if in compliance with Article 725, NFPA-70 (NEC). Open wiring shall be secured with plastic tie wraps to the permanent building structure as approved by the Architect/Engineer.

E. Terminations shall be performed by the Temperature Control Contractor.

F. Wire and conduit not indicated on the Drawings or in the Specifications, but required by the controls supplier, shall be paid for by the Temperature Control Contractor. This includes power supply wiring which is not indicated in the Division 26 drawings but which is necessary for system operation.

G. Temperature control cable is to be properly supported per industry standards and practices. Cable tray shall not be used for installation of temperature control wiring.
   1. Bridle rings shall be used to support wiring in all return air plenums.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that systems are ready to receive work.

B. Beginning of installation means installer accepts existing conditions.

C. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

D. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

E. Ensure installation of components is complementary to installation of similar components.

F. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Airflow measurement sensing elements location and sizing of airflow measurement elements shall be confirmed in the field by local factory representative. Velocity calculation and corresponding differential pressure calculations will be calculated accordingly.

C. Installing contractor shall remote mount the transducer in an acceptable location and provide all pneumatic tubing & wiring required between the transducer and airflow sensors.

D. Check and verify location of thermostats with plans and room details before installation. Locate bottom at 44 inches above floor. Align with lighting switches.

E. Mount freeze protection thermostats using flanges and element holders.

F. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

G. Provide separable sockets for liquids and flanges for air bulb elements.

H. Provide guards on thermostats where indicated.

I. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

J. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

3.03 SEQUENCE OF OPERATION

A. Refer to Specification Section 23 0993 for all equipment sequences of operation.

3.04 OCCUPIED / UNOCCUPIED ZONES

A. Manual Overrides:
   1. Provide manual, push button overrides as a part of each room temperature sensor. Pressing of override button will place zone on which sensor is located into a programmed override that is adjustable through the software.
   2. All zones shall include computer controlled overrides.

B. Refer to specification section 23 0993 for specified zones.

3.05 GUARANTEE

A. It is intended that the Temperature Control Contractor include as part of his bid two (2) year full service warranty. All labor and material shall be guaranteed against defects in workmanship for two (2) year period from the date of Substantial Completion and acceptance by the Owner. Any material proving defective shall be repaired or replaced during that period. This shall not, however, apply to material that has been damaged due to willful negligence.

B. The Contractor will provide hardware and software support during the two year guarantee after the date of acceptance. Hardware support includes replacing of any major or minor components, relays, sensors, etc., that fail to operate properly. Software support includes upgrading of software during warranty period such that system is loaded with latest available revision at end of warranty period.

C. Software support during the two year warranty shall include any programming changes to correct control operation resulting in alarms. All changes shall be cooresponded with the design engineer and owner.

D. Support is also defined to include Owner personnel training needed to operate the system effectively as outlined in this Specification. Explicitly included is the training needed to analyze a building's operation with a view to minimizing energy costs.

3.06 TRAINING

A. The Temperature Control Contractor shall, during the one-year guarantee period, provide no less than (8) 4-hour training sessions to be held at the building site after system is in full operation. A total of two 4 hour training sessions shall be given quarterly during the first 12 months of operation to familiarize maintenance personnel on the operation of the mechanical and control systems through the host computer.

B. Training shall include a hands on process to get owner involved with making changes, setting schedules, monitoring and acknowleding alarms, setting up trends, and monitoring trends.

C. All training shall be video-taped by the control Contractor. Two copies shall be turned over to the owner's maintenance staff.

3.07 SERVICE CHECKS

A. Prior to final inspection, this Contractor shall perform the following service work, including, but not limited to, the following items:
   1. Check and oil electric motors furnished under control system.
   2. Lubricate damper bearings as required.
   3. Check damper travel, adjust and tighten set screws.
   4. Lubricate valve stems, as required, check packing; repair as required.
   5. Calibration of instruments.

6. Check and verify circuitry.
7. Calibrate and checkout controllers, fusing, etc.
8. Test and debug microprocessor and software.
9. Startup and test operation of variable frequency drive with factory authorized personnel.

3.08 FINAL COMPLETION

A. When the work is completed, and at a time directed by the Owner or the Architect/Engineer, the Contractor shall carefully adjust all parts of the equipment and systems. This includes adjustment of automatic controls and safety devices, proper setting of adjustable devices, dampers and valves, and other necessary operations so the systems are fully operable and automatic in operation. Upon completion of the Work, notify the Owner, and/or Architect/Engineer that system is ready for final tests and inspection.

B. At the time of final inspection, this Contractor shall be represented by a person with the proper authority, who shall demonstrate, as directed by the Architect/Engineer, that his Work fully complies with the purpose and intent of the Specifications and Drawings. Labor, services, instruments, and tools necessary for demonstrations and tests shall be provided by the Contractor.

C. The Contractor shall test and adjust each instrument specialty and equipment furnished by him, prior to final acceptance. The Contractor shall demonstrate, for approval by the Architect/Engineer, that subsystems operate as a coordinated and properly functioning, integrated system.

D. The Contractor shall furnish labor, provide adjustments and incidentals necessary to obtain the desired and intended results.

E. The Contractor shall turn over a printed copy and electronic copy of the completed and debugged operating software to the Owner at the conclusion of the first year warranty.

F. The contractor shall provide a list of all devices and their addresses to the owner. This shall be included in the O&M manual.

G. The Contractor shall corrdinate with the Commissioning Agent to run requested trends for demonstration of the functions.

END OF SECTION 23 09 13

SECTION 23 09 93
SEQUENCE OF OPERATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sequence of operation for:
   1. Rooftop Air Handling Unit.
   2. Miscellaneous control items.

1.02 RELATED SECTIONS

A. Section 23 0913 - Instrumentation and Control Devices for HVAC.

1.03 SYSTEM DESCRIPTION

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

B. Sequence of operation shall meet the requirements of ASHRAE Standard 90.1-2019.

1.04 SUBMITTALS

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

B. Temperature Control Contractor shall coordinate a meeting with the Engineer before submitting control sequence to ensure all sequences are understood and to address areas of concern. Sequence of Operation will not be reviewed until this meeting has taken place.

C. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.

D. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
   1. Label with settings, adjustable range of control and limits.
   2. Include written description of control sequence.
   3. Include flow diagrams for each control system, graphically depicting control logic.
   4. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

E. Points List: Submit list of all control points indicating at least the following for each point. The point names used in the field must match the point names served up by the control system.
   1. Name of controlled system.
   2. Point abbreviation.
   3. Point description; such as dry bulb temperature, airflow, etc.
   4. Display unit.
   5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
   6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
   7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
   8. Calculated point (Yes / No); i.e. a “virtual” point generated from calculations of other point values.

F. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

1.05 QUALITY ASSURANCE

A. The installing contractor shall be an experienced, licensed dealer for the BAS system specified. Contractor to have a minimum of five years experience in both installation and maintenance of the units required for this project.

1.06 DEFINITIONS

A. The following are abbreviations used in the sequence of operations below:
   1. OA = Outdoor Air
   2. RA = Return Air
   3. SA = Supply Air
   4. DBT = Dry-bulb temperature
   5. DBToa = Dry-bulb temperature of the outdoor air
   6. DBTra = Dry-bulb temperature of the return air
   7. DBTsa = Dry-bulb temperature of the supply air
   8. DPToa = Dewpoint temperature of the outdoor air
   9. DPTra = Dewpoint temperature of the return air
   10. DPTsa = Dewpoint temperature of the supply air
   11. hoa = Humidity of the outdoor air
   12. hra = Humidity of the return air

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ROOFTOP AIR HANDLING UNITS (RTU-X)

A. Provide a microprocessor based direct digital control system that shall provide the following:
   1. Direct Digital Controller interface.
   2. Occupied-unoccupied control.
   3. Necessary operating interlocks.

B. The packaged rooftop units shall be completely factory wired with necessary controls. The control sequence shall contain algorithms that will make all heating, cooling, and ventilation decisions in response to signals from to BAS control panel. The control algorithm shall maintain accurate temperature control and minimize drift from setpoint. The control microprocessor shall provide anti-short cycle timing and time delay between compressor.

C. Zone Optimal Start: The unit will use an optimal start algorithm for morning start-up. This algorithm will minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of the scheduled occupied period.

D. Occupied Mode:
   1. The outside air damper shall be energized open.
   2. A carbon dioxide sensor in the space shall send a signal to the direct digital controller, with the carbon dioxide level determining the outside air ventilation required. The minimum OA level shall be as indicated on the equipment schedules. The OA dampers shall be set at their minimum position when the space CO2 level is at 800 ppm (low level setpoint). The outside air damper shall modulate open in a linear path between the minimum level and maximum CO2 level (2400 ppm).
   3. Space Temperature Setpoints:
      a. Occupied Heating: 70 F
      b. Occupied Cooling: 75 F
      c. Unoccupied Cooling: 80 F

d. Unoccupied Heating: 65 F

4. Heating Mode:
   a. Upon a call for heating, the controller shall send a signal for heating to the rooftop unit. The unit shall energize the gas fired heat exchanger to maintain space temperature.
5. Cooling Mode:
   a. Upon a call for cooling, the controller shall send a signal for cooling to the rooftop unit. The unit shall energize the DX cooling to main space temperature.
6. Economizer: The economizer will be controlled by the unit. The outside air damper will close and the return air damper will open when the unit is off. During Optimal Start Up the mixed air damper will operate as described in the occupied mode except that the outside air damper will be closed unless free cooling is needed and available.
7. Minimum Outside Air Ventilation – Carbon Dioxide (CO2) Control: When in the occupied mode, the controller will measure the zone CO2 levels and modulate the minimum outside air dampers open on rising CO2 concentrations to maintain a CO2 setpoint of 900ppm (adj.). *Where noted on drawings

E. Unoccupied Cycle
   1. The direct digital controller shall automatically program the unit to the unoccupied control mode.
   2. The unit may be manually placed into full occupied cycle during unoccupied time through the DDC controller for a pre-programmed period of time.
   3. The outside air dampers shall be closed. Return air temperature to the air handling unit will be maintained at 55 degrees F. (adj.)
   4. Supply fan and gas heating system shall cycle as required to maintain reduced space setpoint.

F. Unit Safeties: Smoke Detector: The unit will shut down, close outside air dampers, disable heating and cooling, and generate an alarm when smoke is detected in the unit.

3.02 SPLIT SYSTEM AIR CONDITIONING UNITS

A. Temperature control contractor shall provide a seperate temperatuer sensor to monitor room temperature through the central BAS panel and alarm if room temperature rises above 80 degrees F (adj). Space temperature shall be viewable thru BAS.

3.03 SNOW DAY

A. A "Snow Day" routine shall be provided to return all systems to unoccupied mode upon indication by system operator.

3.04 FIRE ALARM

A. Coordinate with Division 28 and provide necessary contacts to shut down all mechanical equipment during a fire alarm. The system shall be capable of restarting equipment globally upon a "no alarm signal" from the fire alarm panel.

3.05 CRITICAL ALARMS

A. Critical alarms shall dial personal cell telephones, pagers, or home telephones and send email messages to selected school district employees.

B. The following Alarms shall be considered critical alarms:
   1. Technology room space temp. above 85°F (adj.)
   2. Any space temperature dropping below 50 degrees F (adj.)
   3. Any additional alarms deemed critical by the school district and/or the Architect/Engineer.

3.06 DAY/NIGHT ZONES

A. Zones:
   1. Each RTU shall be its own zone. Coordinate the naming of each fo the zones with the owner. The owner shall sign-off and approve the naming of the zones.

END OF SECTION 23 09 93

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

B. Flexible Duct Liner

C. Duct cleaning.

D. Fabric Duct Air Dispersion System.

E. Testing and Repair

1.02 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting: Weld priming, weather resistant, paint or coating.

B. Section 09 91 23 - Interior Painting: Weld priming, paint or coating.

C. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

D. Section 23 07 13 - DUCT INSULATION: External insulation and duct liner.

E. Section 23 33 00 - Air Duct Accessories.

F. Section 23 37 00 - Air Outlets and Inlets.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

F. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.

G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

H. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

I. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.

J. ASHRAE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

K. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

1.04 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for duct materials.

C. Sheet metal shop coordination drawings shall be provided by the Division 23 mechanical contractor. Refer to Section 23 0501 for coordination drawing requirements.

D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK).

E. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.06 QUALITY ASSURANCE

A. Construction of ductwork shall be in accordance with the recommendation of the latest edition of ASHRAE Handbook, HVAC Systems and Equipment, Chapter 16; Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA) Manual, First Edition - 1985 for low pressure duct; SMACNA Manual, Second Edition - 1975 for duct liner application standards; except as otherwise specified.

B. Duct coverings, duct linings, tapes, and core materials in panels used in duct systems shall have a flame spread rating not over 25, without evidence of continued progressive combustion and a smoke developed rating no higher than 50. If coverings and linings are to be applied with adhesives, they shall be tested as applied with such adhesives, or the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating no higher than 50 when in the final dry state.

C. Ductwork, shall be constructed of new prime grade galvanized sheet steel, manufactured in accordance with ASTM A525 standards for hot dip galvanized sheet and ASTM A527 for lock forming quality. Coating weight shall not be less than 1.25 oz. per sq.ft. where used in normal applications. Where marine atmospheres, corrosive industrial pollutants, and cyclic or continuous contact with water is evident, the coating weight shall not be less than 2.5 oz. per sq.ft. Sheets having coating that will flake or peel under any forming operation will not be allowed.
   1. Minimum rectangular duct sheet metal gauges, reinforcement and rigidity shall be in accordance with Table 1-5, SMACNA HVAC Duct Construction Standards, First Edition 1985.

D. Fabric Duct:
   1. Product must be Classified by Underwriter's Laboratories in accordance with the 25/50 flame spread / smoke developed requirements of NFPA 90-A and UL 2518.
   2. All product sections must be labeled with the logo and classification marking of Underwriter's Laboratories.
   3. Manufacturer must have documented design support information including duct sizing; vent, orifice, and/or nozzle location; vent, orifice, and/or nozzle sizing; length; and suspension. Parameters for design, including maximum air temperature, velocity, pressure and textile permeability, shall be considered and documented.

E. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 2 years ofdocumented experience.

1.07 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

1.08 WARRANTY

A. Fabric Duct: 10 year product warranty for products supplied for the fabric portion of this system as well as a design and performance warranty.

1.09 DELIVERY, STORAGE, AND HANDLING

A. All ductwork kept on site shall have open ends wrapped and protected from dirt entering inside of duct. All ductwork and duct accessories shall be kept off floor.

1.10 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.

B. Shower/Locker room exhaust ductwork shall be aluminum construction conforming to ASTM B 209 Alloy 3003, Temper H14. Gauges shall be per the latest issue of SMACNA for listed pressure requirements. Seal all joints liquid-tight. Pitch ductwork back toward grille.

C. Duct Liner:
   1. Shall be factory fabricated double-walled with 1" thick sound insulation and inner perforated galvanized metal liner. Construction shall comply with flame and smoke rating required by NFPA 90A. Metal liner shall be 24 gauge having perforations not exceeding 2.4mm (3/32 inch) diameter and approximately 22 percent free area. Metal liner for fittings need not be perforated. Provide liner couplings/spacer for metal liner. At the end of insulated sections, provide insulation end fittings to reduce outer shell to liner size. Provide liner spacing/concentricity leaving airway unobstructed. Refer to section 23 0713 for insulation requirements. All dimensions shown on the drawings are inside duct dimensions and do not include the dimension of the duct liner.

D. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

E. Pre-Insulated Duct - Contractor Option for exterior duct
   1. Manufacturers:
      a. Pro-R Duct
      b. Thermaduct
      c. Substitutions: See Section 01 6000 (01600) - Product Requirements.
   2. All exterior ductwork shall be ASHRAE 90.1-2010 requirements of R-value=R-6 or above.
   3. Panel to be manufactured of CFC-free phenolic foam thermobonded on both sides to a factory applied 0.001" aluminum foil facing re-inforced with fiberglass scrim.
   4. Duct panel system to meet the requiremenets of UL-181 standard for Class 1 air ducts.
      a. Pressure rating: 4 inches WG positive and 4 inches WG negative.
   5. Duct panel system to meet requirements of 25/50 flame, smoke classification.
   6. Duct Construction:
      a. The contractor responsible for the fabrication and installation shall be authorized with manufacturer and shall have successfully completed a specialized training seminar sponsored by the manufacturer.

b. All duct segments to be fabricated, handled and installed in accordance with the manufacturer's design guidelines.
c. Duct segments are to be constructed utilizing the V-groove method of fabrication. All external seams shall be taped, and all internal seams shal be fully ealed with an unbroken layer of silicon. Each duct segment shall be flanged with either aluminum grip profile or tiger connectors in accordance with manufacturer's recommendations. Duct reinforcement shall be applied to protect against side deformation from both positive and negative pressure per the manufacturer's design guidelines based on ductwork size and system pressure.
d. All fabricated duct segment fittings shall be designed in accordance with "SMACNA HVAC Duct Construction Standards" latest edition.
e. Install Hangers per maufacturer's requirements.

F. Low Pressure Insulated Flexible Ducts:
1. Manufacturers:
a. Flexmaster Model 5M.
b. Thermaflex, Model M-KC
c. Buckley, Model Type 2.
d. Substitutions: See Section 01 6000 - Product Requirements.
2. Three ply aluminum/fiberglass/aluminized polyester film supported by helically wound spring steel wire; 1 inch thick, 3/4 lb. density, fiberglass insulation; air tight aluminized fire retardant vapor barrier film.
a. Pressure Rating: 5 inches WG positive and 5 inches WG negative.
b. Maximum Velocity: 4000 fpm.
c. Temperature Range: -10 degrees F to 160 degrees F.

G. High Pressure Flexible ducts
1. Manufacturers:
a. Flexmaster Model 3M.
b. Thermaflex, Model M-KC
c. Buckley, Model Type 3
d. Substitutions: See Section 01600 - Product Requirements.
2. Insulated, flexible high pressure ducts shall be used for connecting high velocity branch runouts to terminal units and other related equipment on the high pressure side of the system and shall have an inner core of all metal construction, consisting of a bonded 3 ply laminate, mechanically corrugated for strength and air tightness and covered with a one inch thick fiberglass blanket of one pound density, and an airtight foil fire retardant skin over the insulation.
a. Pressure Rating: 10 inches WG positive and 1.0 inches negative.
b. Maximum Velocity: 4000 fpm.
c. Temperature Range: -20 degrees F to 210 degrees F.

H. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
a. All sealers and sealants shall meet the low VOC requirements for LEED. Refer to Division 01 of the specifications for additional information.

I. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

J. A maximum length of 12" of flexible ductwork will be allowed in the exhaust and return air ductwork systems. Contractor shall ensure that flexible ductwork used in these systems are sealed air tight to the sheet metal duct.

2.03 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

D. Provide air foil turning vanes of performated metal with glass fiber insulation in all rectangular elbows in the supply air stream, return air stream, and exhaust air stream for all duct sizes with a width greater then 12" and a height greater then 12" (12"x12").

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

G. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

H. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

I. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct. Bottom of ductwork shall be sloped down to louver to allow rain, snow, etc. to run out of ductwork.

J. All sheetmetal ductwork in the student dining / stage, shop areas, and other areas with exposed ductwork shall have paint grip type construction. All ductwork to be painted shall have the exterior wiped down after installation with proper cleaning solution to remove any oils, grease, etc. that would prohibit paint from sticking to ductwork. Painting of ductwork shall be by General Contractor.

2.04 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages,reinforcing, and sealing for operating pressures indicated.

B. Construct ductwork of new prime grade galvanized sheet steel, manufactured in accordance with ASTM A525 standards for hot dip galvanized sheet. Coating weight shall not be less than 0.90 oz. per sq.ft. where used in normal applications. Sheets having coating that will flake or peel under forming operation will not be allowed.

C. Installation of sheet metal ducts and related work shall comply with applicable Local, State and National Codes, rules, regulations and ordinances, including the following specific codes:
   1. Air conditioning and ventilating systems of other than residence type NFPA No. 90A.
   2. Air conditioning, warm air heating, air cooling, and ventilating systems NFPA No. 90B.

D. Minimum round duct sheet metal gauge shall be as follows:
   1. Diameter 3 through 14 inches: Spiral Seam Gauge = 26, Longitudinal Seam Gauge = 24.
   2. Diameter 15 through 26 inches: Spiral Seam Gauge = 24, Longitudinal Seam Gauge = 22.

3. Diameter 27 through 36 inches: Spiral Seam Gauge = 22, Longitudinal Seam Gauge = 20.
4. Diameter 37 through 50 inches: Spiral Seam Gauge = 20, Longitudinal Seam Gauge = 20.
5. Diameter 51 through 60 inches: Spiral Seam Gauge = 18, Longitudinal Seam Gauge = 18.

E. Minimum flat oval duct sheet metal gauge shall be as follows:
1. Major Dimension Duct Width up through 24 inches: Spiral Seam Gauge = 24, Longitudinal Seam Gauge = 20.
2. Major Dimension Duct Width 25 through 36 inches: Spiral Seam Gauge = 22, Longitudinal Seam Gauge = 20.
3. Major Dimension Duct Width 37 through 48 inches: Spiral Seam Gauge = 22, Longitudinal Seam Gauge = 18.

F. Fittings for duct construction shall be of sheet metal gauges as follows:
1. Duct Diamter/Major Dimension 3 through 14 inches: Spiral Seam Gauge = 24, Longitudinal Seam Gauge = 20.
2. Duct Diameter/Major Dimension 15 through 26 inches: Spiral Seam Gauge = 22, Longitudinal Seam Gauge = 20.
3. Duct Diameter/Major Dimension 27 through 36 inches: Spiral Seam Gauge = 20, Longitudinal Seam Gauge = 20.
4. Duct Diameter/Major Dimension 37 through 50 inches: Spiral Seam Gauge = 20, Longitudinal Seam Gauge = 18.
5. Duct Diameter/Major Dimension 51 through 60 inches: Spiral Seam Gauge = 18, Longitudinal Seam Gauge = 18.

G. Provide with Class A seals for all duct joints.

H. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, 45 degree and 90 degree fittings as indicated on the drawings, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips. Special fittings as required and where not of standard construction shall be factory fabricated to fit the ductwork furnished on the Project.

2.05 METAL DUCT HANGERS AND SUPPORTS

A. Support horizontal ductwork runs with suitable strap or trapeze hangers on 6 foot centers. Where duct weight for the 6 foot length is less than 40 pounds, space hangers 8 feet on center. Support vertical risers at floors with galvanized steel angles riveted to duct on all sides. Size of angles shall be one gage heavier than the ductwork it is supporting.

B. Ductwork may be supported using load rated cable suspension system equal to Gripple Hang-Fast system. Suspension system shall have a specified manufacturer's Save Working Load (SWL) and supplementary safety factor of at least 5 times the SWL.
1. Suspension system shall be verified by SMACNA Testing and Research Institute to be in compliance with SMACNA Duct Construction Standard Guidelines (1995 Ch 4).
2. Support ductwork at 6' on center for all round supply 22 inch in diameter or equivlaent square and over. For all supply over 20" support on 6 ft centers.
   a. Mechanical contractor shall consult hanger manufacturer sizing chart for proper hanger sizing based on supported weight.
3. The "Clutcher" cable hanging system manufactured by Ductmate is not an acceptable product and shall not be used.

C. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
   1. Bases: High density polypropylene or UV resistant rubber.
   2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
   4. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
   5. Height: Provide minimum clearance of 6 inches under duct to top of roofing.
   6. The engineering for support and anchorage delegated to the contractor responsible for putting it up there.

2.06 FABRIC DUCT AIR DISPERSION SYSTEM

A. Manufacturers
   1. Ductsox
   2. K.E. Fibertec
   3. Fabric Air
   4. Substitutions: Not Permitted.
   5. Approved equals must be able to provide system with true nozzles and non prorated 10 year warranty. Ducts which do not discharge air perpendicular to the length of the duct, shall not be acceptable. Product substitutions must be pre-approved, in writing, by the project engineer and/or architect, at least ten days prior to bid opening.

B. Dispersion System:
   1. Fabric duct shall be round constructed of a woven polyester with non-permeable fire retardant fabric complying with the following physical characteristics:
      a. Fabric Construction: 100% Flame Retardant fabric.
      b. Weight: 6.8 oz/sq yd per ASTM D3776
      c. Color: Per Room Finish Selection Schedule by architect.
      d. Air Permeability: 2 cfm/sf ft per ASTM D737, Frazier
      e. Temperature range: 0 degrees F to 180 degrees F.
      f. Fire Retardancy: Classified by Underwriters Laboratories in accordance with the flame spread/smoke developed requirements of NFPA 90-A and UL 2518.
   2. Textile system to be constructed in modular lengths (zippered) with proper radial securing clips (inlets, endcaps, and mid-sections) and top access zippers for tension lock attachments.
   3. Integrated air dispersion shall be specified and approved by manufacturer.
      a. Orifices
         1) Air dispersion and extended throws are accomplished by orifices. Dispersion orifice sizing, up to 5 inch diameter (design dependent).
         2) Diameter, quantity, and location of orifices to be specified and approved by manufacturer.
   4. 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.
   5. Inlet connection includes zipper for easy removal / maintenance.
   6. Lengths to include required intermediate zippers as specified by manufacturer.

7. 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.
8. End cap includes zipper for easy maintenance.
9. Each section of the textile shall include identification labels documenting order number, section diameter, section length, piece number, code certifications and other pertinent information.

C. Performance
1. System overall design; diameter, length, airflow, operating static pressure and dispersion shall be designed or approved by the manufacturer.
2. Provide fabric ducts that have, as minimum, throw and/or near zone velocity ratings, and static and inlet velocity pressure ratings for each fabric duct as shown on drawings and/or schedules.
3. Use fabric ducts for positive pressure applications only.
4. Do not use fabric ducts in concealed locations.
5. Systems should be designed from .25" water grade minimum in order to keep ducts fully inflated. Maximum 3.1", however, most applications should be designed around .50" water grade.

D. Fabric Ductwork Suspension System
1. SkeleCore Pull-Tight System: Air diffusers shall be constructed with both internal retention and external tensioning.
a. System shall consist of internal tensioning baskets with cable or track stops that externally tension the system off of the suspension system selected below along with 360 degree internal retention hoops that are spaced 5 ft on center between tensioning baskets.
b. Tensioning baskets are designed to self-lock when tension is applied to the system.
c. All straight sections utilize both internal retention hoops and external tensioning with the use of the tension baskets, all fittings(crosses, elbows, reducers, and tees) utilize internal retention hoops.
d. Distance between consecutive tensioning baskets should not be more than 40'.
e. System shall be installed with a one row suspension system located 1.5" above top-dead-center of the textile system.
f. System attachment to cable or U-Track shall be made using Gliders spaced no further than 12 inches apart.
g. One row suspension options
1) Cable suspension hardware to include galvanized steel cable, eye bolts, thimbles, cable clamps, and turnbuckle(s) as required.
(a) Support lengths available in 5'(standard), 10', 15', & 30'.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install in accordance with manufacturer's instructions.

C. Fabric Duct Installation: Install chosen suspension system in accordance with the requirements of the manufacturer. Instructions for installation shall be provided by the manufacturer with product.

D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

E. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

H. Use crimp joints with bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

I. Use double nuts and lock washers on threaded rod supports.

J. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

K. Connect diffusers to low pressure ducts with 10 feet maximum length of flexible duct held in place with strap or clamp.

L. Connect flexible ducts to metal ducts with adhesive tape and draw bands.

M. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

N. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

O. Ducts shall be installed substantially as indicated on the Drawings. However, where conflicts occur with other trades, the Architect/Engineer reserves the right to require the Contractor to make minor changes in duct locations without extra cost to the Owner.

P. Locate ductwork within walls, ceilings, utility or pipe spaces, chases, joist spaces, and the like, insofar as is practical and so that such Work will be properly concealed.
   1. Space sufficiently distant from other Work and from adjacent lines, ducts, etc., to permit maintenance, replacement, insulation, etc., so not less than 1 inch space will exist between completed finished surfaces.
   2. Space parallel runs of ductwork so that each individual run of duct can be separately insulated. Parallel runs of duct or piping, insulated as a bundle, will not be accepted.
   3. This Contractor shall clean the interior of ductwork and fittings, leaving area clean and free of loose insulation and other construction debris.
   4. Provide flexible connections at all fan powered equipment on inlet and discharge sides of equipment.

Q. Support horizontal ductwork runs with suitable strap or trapeze hangers on 6 foot centers. Where duct weight for the 6 foot length is less than 40 pounds, space hangers 8 feet on center. When weight of duct between hangers does not exceed 60 pounds, hangers shall be 1 inch wide by 18 gauge. For greater weights, use trapeze hangers 6 feet on center, as approved by Architect/Engineer. Support vertical risers at floors with galvanized steel angles riveted to duct on all sides. Size of angles shall be one size heavier than scheduled for stiffer angles.

R. Pack and caulk around ductwork passing through walls and floors where required to prevent sound transmission using fiberglass packing and metal collar.
   1. Connect to walls with galvanized angles anchored to wall and construction. Seal angles using approved sealant compound.

S. Seal ductwork connections to exterior wall louvers using waterproof silicone or polyurethane sealant.
   1. Bottom of ductwork shall be sloped up minimum of 30 degrees toward inside of building to control entry of water.

T. Clean interior of ductwork, leaving it free of loose material and construction debris.

U. Where water piping is installed over electrical switchgear, provide .015, #302, 18-8 stainless steel or 20 oz. copper pans with soldered joints and approved drains to suitably protect switchgear.

V. Sheet metal elbows and fittings shall be constructed to comply with the following:
   1. Curved elbows shall have a radius not less than 150 percent of duct width to the centerline of the duct (R/D = 1.5).
   2. Where R/D ratio is less than 1.5, use hollow vane (air foil) vanes or turn blades.
   3. Elbows and other fittings shall be constructed the same as required for straight runs of ductwork. Round elbows shall be crimped and beaded on the downstream end. Square elbows must have turning vanes.
   4. When air foil vanes are used in elbows, elbows may have square throat and heel or radius heel and radius throat.

W. Provide, where denoted on Drawings and in square elbows of low pressure ducts, air turning vanes designed to carry the air around the 90 degree bend without eddying or pressure fluctuations in the turn. Vanes shall be formed blade type and of standard catalog product of reputable manufacturer. Manufacturer of air turns shall recommend the number and size of blades. Air turns shall be the complete unit type installed along the diagonals of each square elbow.
   1. Refer to specification section 23 3300 for additional requirements.
   2. Vanes shall be constructed and installed to limit pressure loss to not more than 20 percent of the velocity pressure.

X. At exterior wall louvers, seal duct to louver frame and install blank-out panels. Slope bottom of ductwork down to louver to allow rain, snow, etc. to run out of ductwork.

Y. Install suspension system in accordance with manufacturer's requirements. Installation instructions shall be provided with fabric duct system by unit manufacturer.

Z. All sheetmetal ductwork in areas with exposed ductwork shall have paint grip type construction. All ductwork to be painted shall have the exterior wiped down after installation with proper cleaning solution to remove any oils, grease, etc. that would prohibit paint from sticking to ductwork. Painting of ductwork shall be by General Contractor. Color shall be per room finish selection schedule by architect.

3.02 TESTING AND REPAIR

A. Ductwork shall be sealed and leak tested as required by ASHRAE Standard 90.1.

B. Upon completion of each respective ductwork system, but prior to insulating, covering, or backfilling, each system shall be thoroughly cleaned to remove construction dirt and foreign matter.

C. Test Ductwork as Specified Herein
   1. No ductwork work shall be concealed or covered until it has been inspected and approved by the project inspector, who shall be notified when the Work is ready for inspection. Work shall be completely installed and tested as required by this Contract and Ordinances of the local Municipality and shall be leaktight to the satisfaction of those making the inspection and the Architect/ Engineer.
   2. In general, pressure tests shall be applied to ductwork. In no case shall piping be subject to pressure exceeding its rating. Defective work shall be promptly repaired or replaced and test shall be repeated until the particular system and component parts thereof receive approval of the Architect/Engineer.
   3. Provide temporary equipment for testing, including blower and gauges. Test ductwork system before insulation is installed and remove control devices before testing. Test each

natural section of each ductwork system independently, but do not use ductwork dampers to isolate sections where test pressure exceeds damper pressure rating.

4. Repair ductwork system sections which fail required ductwork test by disassembly and reinstallation, using new materials to extent required to overcome leakage. Do not use chemicals, stopleak compounds, mastics, or other temporary repair methods.
5. Pressure for Testing of Ductwork Systems shall be as follows:
   a. High and Medium Pressure Ductwork (above 2 inch static pressure w.g.)
      1) Ductwork Systems include: VAV systems upstream of terminal boxes.
      2) Ductwork systems shall be sealed to SMACNA Seal Class B.
      3) Ductwork systems shall be tested for leakage in accordance with SMACNA leakage class 12 for rectangular ductwork and leakage class 6 for round ductwork.
      4) Leakage test procedures shall follow the outlines and classifications in the SMACNA HVAC Duct Leakage Test Manual.
      5) If the tested ductwork fails to meet allotted leakage level, the contractor shall modify to bring it into compliance and shall retest it until acceptable leakage is demonstrated.
      6) Testing apparatus shall be a high pressure air source consisting of a portable rotary blower having an inlet damper, and flow measuring device consisting of straightening vanes and an orifice plate installed in a straight tube having properly located pressure taps. Pressure and assembly shall have its own calibrated capacity curve. Pressure and flow reading shall be taken by using "U-tube" manometers.
   b. Low Pressure Ductwork (2 inch static pressure and below w.g.)
      1) Ductwork Systems include: Constant Volume Systems, Ductwork downstream of terminal air devices, exhaust ducts.
      2) Ductwork systems shall be sealed to SMACNA Seal Class C.
      3) Ductwork systems shall be tested for leakage in accordance with SMACNA leakage class 24 for rectangular ductwork and leakage class 12 for round ductwork.
      4) Leakage test procedures shall follow the outlines and classifications in the SMACNA HVAC Duct Leakage Test Manual.
      5) If the tested ductwork fails to meet allotted leakage level, the contractor shall modify to bring it into compliance and shall retest it until acceptable leakage is demonstrated.
      6) Testing apparatus shall be a high pressure air source consisting of a portable rotary blower having an inlet damper, and flow measuring device consisting of straightening vanes and an orifice plate installed in a straight tube having properly located pressure taps. Pressure and assembly shall have its own calibrated capacity curve. Pressure and flow reading shall be taken by using "U-tube" manometers.
6. Accurately record and report methods of testing, times, and dates of test, witnesses to the test, and the results of the test. Test reports shall be neatly typewritten on standard 8-1/2 inch by 11 inch sheets and submitted in 5 copies to Architect/Engineer for approval within 5 days after test has been performed.

D. Damage resulting from tests shall be repaired or damaged materials replaced, to satisfaction of Architect/Engineer, and at no cost to Owner.

3.03 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

B. Temporary Closure: At ends of ducts which are not connected to equipment or distribution devices at time of ductwork installation, cover with polyethylene film or other covering which will keep the system clean until installation is completed.

C. Fabric Duct Cleaning and Protection:
   1. Clean air handling unit and ductwork prior to the DuctSox system unit-by-unit as it is installed. Clean external surfaces of foreign substance which may cause corrosive deterioration of facing.
   2. Temporary Closure: At ends of ducts which are not connected to equipment or distribution devices at time of ductwork installation, cover with polyethylene film or other covering which will keep the system clean until installation is completed.
   3. If fabric duct systems become soiled during installation, they should be removed and cleaned following the manufacturers standard terms of laundry.

3.04 SCHEDULES

A. Ductwork Material:
   1. Low Pressure Supply (Heating Systems): Galvanized Steel.
   2. Low Pressure Supply (Cooling System): Galvanized Steel.
   3. Return and Relief: Galvanized Steel.
   4. General Exhaust: Galvanized Steel.
   5. Shower/Locker room: Aluminum
   6. Outside Air Intake: Galvanized Steel.
   7. Gymnasium/Multipurpose Room Supply: Fabric Duct.

END OF SECTION 23 31 00

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices
B. Backdraft dampers.
C. Duct access doors.
D. Duct test holes.
E. Flexible duct connections.
F. Volume control dampers.

1.02 RELATED REQUIREMENTS

A. Refer to Section 01 6000 - Product Requirements
B. Section 01 3516.01 - Material Documentation Sheet
C. Section 01 5721 - IAQ Construction and Preoccupancy
D. Section 01 5721.01 - IAQ Planning Checklist
E. Section 01 5721.02 - IAQ Insepction Checklist
F. Section 01 5721.03 - IAQ Log
G. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
H. Section 01 6116.01 - Accessory Material VOC Content Certification Form.
I. Section 23 05 48 - Vibration and Seismic Controls.
J. Section 23 31 00 - HVAC Ducts and Casings.
K. Section 23 36 00 - VARIABLE AIR TERMINAL UNITS: Pressure regulating damper assemblies.
L. Section 26 05 83 - EQUIPMENT WIRING: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
B. NFPA 92 - Standard for Smoke Control Systems; 2021.
C. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.
D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.
E. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
F. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
G. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.

D. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

B. All ductwork accessories kept on site shall be wrapped and protected from dirt. All ductwork and duct accessories shall be kept off floor.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Air turning vanes/extractors shall be installer fabricated or manufactured.

B. Air turning vanes/extractors shall be provided where denoted on drawing and in all square elbows of low pressure supply, return, and exhaust ducts for sizes above 12"x12". Air turning vanes/extracotrs shall be designed to carry the air around the 90 degree bend without eddying or pressure fluctuation in the turn. Vanes shall be formed blade type and of standard catalog product of a reputable manufacturer. Manufacturer of air turns and extractors shall recommend the number and size of vanes. Air turning vanes shall be the complete unit type installed along the diagonals of each square elbow.

C. Vanes shall be constructed and installed to limit pressure loss to not more then 20 percent of velocity pressure.

2.02 BACKDRAFT DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc
   2. Nailor Industries Inc
   3. Ruskin Company
   4. Greenheck.
   5. Vent Products.
   6. Air Balance, Inc.
   7. United Enertech
   8. Loren Cook Company
   9. Pottorff
   10. Substitutions: See Section 01 6000 - Product Requirements.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel or Extruded aluminum, with blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.
   1. Provide counterbalance for building pressure activation.

2.03 DUCT ACCESS DOORS

A. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
   1. Less Than 12 inches Square: Secure with sash locks.
   2. Up to 18 inches Square: Provide two hinges and two sash locks.

3. Up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.

B. Access doors with sheet metal screw fasteners are not acceptable.

2.04 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.

2.06 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc
   2. Nailor Industries Inc
   3. Ruskin Company
   4. Greenheck
   5. Air Balance, Inc.
   6. Vent Products
   7. United Enertech
   8. Pottorff.
   9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Rectangular
   1. Dampers shall be of opposed blade construction.
   2. Frame shall be 5 inches by 1 inch by 16 gauge galvanized steel.
   3. Blades shall be 6 inches wide by 16 gauge galvanized steel.
   4. Linkage shall include a locking device to hold damper in a fixed position.

D. Round
   1. Dampers shall be of the butterfly type consisting of a circular blade mounted to the shaft.
   2. Frames shall be 20 gauge galvanized steel up to 20 inches diameter, 7 inches long.
   3. Blades shall be 20 gauge galvanized steel.
   4. Control shaft/hand quadrant shall be located on a square shaft and shall be lockable.
   5. Bearings shall be molded synthetic or bronze.
   6. Provide a minimum 1 1/2" shaft extension on manual dampers located in supply ductwork, to accomodate exterior ductwork insulation, to allow manual damper handle to be clear of supply ductwork.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 31 00 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

G. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

H. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

I. Air turning vanes shall be provided where denoted on drawings and in square elbows of low pressure ducts.

END OF SECTION 23 33 00

SECTION 23 34 23
HVAC EXHAUST FANS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof exhausters.

B. Cabinet exhaust fans.

C. Inline / Ceiling exhaust fans.

1.02 RELATED REQUIREMENTS

A. Refer to Section 01 6000 - Product Requirements

B. Commissioning
   1. Section 01 9113 - General Commissioning Requirements
   2. Section 01 9114 - Commissioning Authority Responsibility

C. Section 23 0548 - Vibration and Seismic Controls.

D. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.

1.03 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

B. AMCA 99 - Standards Handbook; 2016.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

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

H. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.

I. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 FIELD CONDITIONS

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Greenheck:

B. Loren Cook Company:

C. Twin City Fan Co.

D. PennBarry:

E. Acme Engineering and Manufacturing Corp.

2.02 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.

B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.

D. Fabrication: Comply with AMCA 99.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 ROOF EXHAUSTERS

A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

B. Direct Drive Fans: VariGreen ECM high efficient motors. Fan speed controller.

C. Roof Curb: 8 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.

D. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and wall mounted multiple speed switch.

E. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

F. Belts and Drives: Where required, belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150 percent of the installed motor horsepower. The variable pitch motor drive must be factory set to the specification fan RPM.

1. Provide automatic belt tensioner for all belt drive fans to help reduce maintenance costs and increase belt life.

G. Finish: Provide an electrostatically applied, baked polyester powder coat finish. Coating must exceed 1,000 hour salt spray under ASTM B117 test method, 1,000 hour humidity resistance under ASTM D2247 test method, pencil hardness 2H under ASTM D3363 test method. The color for roof mounted exhaust fans shall be as selected by the architect from the manufacturer's standard colors.

2.04 CABINET EXHAUST FANS

A. Centrifugal Fan Unit: V-belt or direct driven as indicated with galvanized steel housing lined with acoustic insulation, resilient mounted motor. Backdraft damper to be provided by the unit manufacturer. Refer to section 23 3300 for backdraft damper requirements.

B. Disconnect Switch: Unit shall be provided with a factory mounted disconnect switch (UL approved), belt guard, unit mounted solid state speed controller for direct drive units.

C. Backdraft Damper: motorized, non-overloading motor, aluminum frame, aluminum multiple blade construction, gasketed edge, aluminim hinge pins, brass bushings, blades linked. Provide all Inline exhausters with fan manufacturer's motorized backdraft damper.

D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

E. Belts and Drives: Where required, belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150 percent of the installed motor horsepower. The variable pitch motor drive must be factory set to the specification fan RPM. Automatic belt tensioner shall be provided with all belt drive fans.

F. Direct Drive Fans: Provide a Fan Speed controller.
   1. Fan speed controller shall be mounted directly at exhaust fan and be used for balancing purposes only.

2.05 DRYER EXHAUST BOOSTER

A. Manufacturers
   1. Fantech.
   2. Dayton Fans.
   3. Patton.
   4. Valu-Cool.
   5. Substituions: Section 01 6000 - Product Requirments.

B. The dryer booster system shall consist of an integral centrifugal fan and positive pressure sensing switch specifically designed for residential dryer vent boosting. Fan shall be tested and approved by UL and CSA for safety.

C. Performance: Bryer booster fan shall be capable of maintaining an air velocity of 1200 fpm with an equivalent of 130 feet of 4 inch rigid stell duct.

D. Fan: housing shall be constructed of heavy gauge galvanized sheet metal, unit shall have internal air straightening vanes, externally mounted electrical terminatal box and pre-wired terminal strip connections.

E. Motor: Motorized impeller shall be an external rotor type, class B insulation, totally enclosed permanent split capacator type. Bearings shall be permanently sealed self lubricating ball type. Motor shall be equipped with automatic reset thermal overload protection.

F. Wheel: Fan wheel shall be backward inclined, centrifugal type with inlet venturi, impeller shall be statically and dynamically balanced.

G. Switch: Intergral positive pressure sensing switch shall be mounted on the fan and prewired to the terminal strip provided in fan junction box. Switch shall be set to 0.05 inch w.g. static pressure. Switch shall incorporate a delay-on-break timer cycle to maintain fan performance for intervals of 10 minutes until drying cycle is complete.

H. Unit shall be provided with a minimum 5-1/2 ft long 120 VAC power cord.

I. Accessories: A wall mounting bracket shall be provided with the each fan.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

C. Hung Cabinet Fans:
   1. Install fans with spring isolators and flexible electrical leads. Refer to Section 23 0548.
   2. Install flexible connections specified in Section 23 33 00 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

D. Provide sheaves required for final air balance.

E. Install backdraft dampers on inlet to roof and wall exhausters.

F. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION 23 34 23

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

C. Roof hoods.

1.02 RELATED REQUIREMENTS

A. Refer to Section 01 6000 - Product Requirements

B. Section 01 3516.01 - Material Documentation Sheet

C. Section 01 5721 - IAQ Construction and Preoccupancy

D. Section 01 5721.01 - IAQ Planning Checklist

E. Section 01 5721.02 - IAQ Insepction Checklist

F. Section 01 5721.03 - IAQ Log

G. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

H. Section 01 6116.01 - Accessory Material VOC Content Certification Form.

I. Section 23 3100 - HVAC Ducts and Casings.

J. Section 09 91 23 - Interior Painting: Painting of ducts visible behind outlets and inlets.

1.03 REFERENCE STANDARDS

A. ADC 1062: GRD - Test Code for Grilles, Registers & Diffusers; Air Diffusion Council; 1984.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012.

C. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (R2011).

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Project Record Documents: Record actual locations of air outlets and inlets.

1.05 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

C. NFPA 90A for installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Krueger-HVAC: www.krueger-hvac.com/#sle.

B. Price Industries: www.price-hvac.com/#sle.

C. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com/#sle.

D. _____.

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROUND CEILING DIFFUSERS: TYPE RD

A. Fabrication: 18 gauge steel with primed baked enamel coating. Diffusers to be painted in field by general contractor. Color by architect.

B. Type: Round, adjustable pattern, stamped or spun, multi-core diffuser to discharge air in uniform 360 degree pattern, with four sectorizing cones. Open ceiling application.

C. Adjustable vertical to horizontal discharge pattern. Three inner cores shall be constructed as a single inner assembly and must be easily removable using a spring lock mechanism. Adjustment shall be made by rotating center cone clockwise/counterclockwise.

D. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

E. Titus: Model TMRA, Krueger: Model RM2, Price: Model RCDA, Tuttle & Bailey: Model A110. Nailor: Model

2.03 CEILING SUPPLY: TYPE CD1

A. Fabrication: Heavy gauge aluminum extrusions with factory off-white enamel finish. Inner core assembly consisting of fixed deflection louvers available in one, two, three, and four-way flow patterns. Refer to drawings for flow patterns required.

B. Core sizes as indicated on the drawings. Core sizes shall be 18"x18" unless otherwise noted.

C. Core shall be easily removable from face of diffuser.

D. Square inlet with round transition piece for connection to round duct.

E. Outer frame shall be 22"x22" square for installation in 2' square ceiling grid.

F. Design based on Titus: model TDC-AA, Krueger: Model 5SH, Price: Model AMD, Tuttle & Bailey: Model AM.

2.04 EXHAUST, RETURN AND AIR TRANSFER: TYPE EG, RG, AT

A. Fabrication: Aluminum with 20-gauge minimum frames and 22 gauge minimum blades.

B. 35 degree louvers spaced 1/2 inch on center.

C. One set of fixed louvers parallel to long dimension.

D. Baked white enamel or powder paint white finish for ceiling installation and prime coat for side wall installation for final painting in field to match walls.

E. Frame: 1-1/4 inch margin with countersunk screw mounting for wall mounted and drywall ceiling installation.

F. Frame: 1-1/4 inch margin for lay-in ceiling application.

G. Design based on Titus, model 355FL, Krueger: Model S585, Price: Model 635, Tuttle & Bailey: Model A70D5.

2.05 DUCT SUPPLY REGISTERS/GRILLES: TYPE DD

A. Type: Direct spiral duct-mounted supply grilles. Streamlined and individually adjustable curved blades to discharge air along face of grille with two-way deflection. Front blades parallel to short dimension. Rear blades parallel to long dimension. Provide air scoop.

B. Frame: Curved border to match duct diameter, 1-1/4 inch margin with countersunk screw mounting and foam gasket for air tight seal.

C. Prime coat for for final painting in field by general contractor. Color by architect.

D. Fabrication: Aluminum extrusions with factory prime coat finish.

E. Blades: Heavy duty aluminum, 3/4" spacing, individually adjustable without loosening or rattling.

F. Damper: Air scoop damper/extractor shall be heavy duty aluminum, integral, operable from the face with a screw driver.

G. Design based on Titus moel S300FS, Krueger: Model DMGDR, Price: Model SDGE

2.06 WALL SUPPLY REGISTERS/GRILLES: TYPE SD

A. Type: Streamlined and individually adjustable blades to discharge air along face of grille with two-way deflection. Front blades parallel to long dimension. Rear blades parallel to short dimension.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and foam gasket for air tight seal.

C. Fabrication: Aluminum extrusions with factory prime coat finish.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

E. Baked white enamel or powder paint white finish for ceiling installation and prime coat for side wall installation for final painting in field to match wall color. Final painting by general contractor.

F. Design based on Titus model 300FS, Krueger: Model 5885 Aluminum, Price: Model 620, Tuttle & Bailey model A64

2.07 HEAVY DUTY WALL GRILLE: TYPE HDG

A. Type: Steel construction with fixed blades with 1/2 inch spacing and 38 degree deflection. Blades parallel to long dimension.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Steel construction with 16 gage frame and 14 gage blades, with factory off-white enamel finish. Corners shall be welded with full penetration resistance welds with a reinforcing patch for extra strength. Bars shall be reinforced by perpendicular, steel support bars spaced on 6-inch maximum centers.

D. Prime coat for side wall installation for final painting in field to match wall color. Final painting by general contractor.

E. Design based on Titus model 33RL. Krueger: Model S48(H/V), Price: Model 91, Tuttle & Bailey model T116H-1.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers. If dampers are specified and provided as part of the diffuser, or grille and register assembly balancing dampers are not required.

E. Refer to drawings for diffuser sizes, air flow patterns, etc.

F. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 91 23.

END OF SECTION 23 37 00

SECTION 23 37 10
EXTERIOR WALL LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rectangular drainable wall louvers

B. Thin line wall louvers

1.02 RELATED REQUIREMENTS

A. Section 23 3100 HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.

B. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractor's National Associaton.

1.04 SUBMITTALS

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

B. Submittals of units noting the size, material, performance and exactness to specification shall be required.

C. Shop drawings of louvers and color selection must be approved by the Architect/Engineer before fabrication of louvers is started.

D. Submit three sets of color samples for selection by architect.

1.05 QUALITY ASSURANCE

A. Units shall meet or exceed the requirements and quality of the components herein specified and as denoted on the Drawings.

B. No dissimilar metals, which might induce electrolysis, shall be used in the construction, screenings, or mounting of the louvers.

C. All published ratings shall be based on testing in accordance with AMCA Standard 511.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ruskin

B. Louvers and Dampers, Inc..

C. American Warming and Ventilating, Inc.

D. Greenheck.

E. United Enertech.

F. Dowco.

G. Air Balance

H. Industrial Louvers, Inc

I. Pottorff

J. Substitutions: See Section 01 6000 - Product Requirements.

2.02 RECTANGULAR DRAINABLE WALL LOUVERS-TYPE -HORIZONTAL

A. Stormproof, aluminum construction

B. Maximum pressure drop .20 inch S.P. at 1000 FPM free area velocity.

C. Wind Driven Water Penetration Performance:
   1. Based on testing 39 inch x 39 inch (1m x 1m) core area, 41 inch x 44 inch (1.04m x 1.12m) nominal size unit in accordance with AMCA 500-L.
   2. Wind Velocity: 29 mph (46.4 kph).
   3. Rainfall Rate: 3 inches/hour (76 mm/hour).
   4. Air Volume: 6,207 cfm (176 m3/min).
   5. Core Velocity: 588 fpm (3 m/second).
   6. Free Area Velocity: 1,139 feet per minute (347 m/min).
   7. Water Resistance Effectiveness: 99.3% (AMCA Class A).
   8. Discharge Loss Classification (Intake Test): Class 2 (.3 to .399).

D. Aluminum bird screen of .051 material tightly stretched and suitably braced to prevent sagging.

E. Frame shall be 6 inches deep and constructed of 6063T5 extruded aluminum of .081 inch minimum wall thickness.

F. Blades shall be horizontal, rain resistant style, constructed of 6063T5 extruded aluminum of .081 inch nominal wall thickness. Blades shall be the drainable type, positioned at a minimum 45 degree angle with 2.25 inch spacing center to center.

G. Sills and jambs shall be one piece structural members. Corners to be mitered and continuously heliarc welded. Structural supports shall be designed for 20 PSF wind load. Fastenings shall be aluminum or stainless steel.

H. Include sills, mullion, sill extensions, and anchorages as required.

I. Finish shall be factory applied baked enamel to color as selected by Architect. Contractor shall assume two (2) standard colors.

J. Rectangular louvers shall be equal to the design base Greenheck, Model 'EHH-501'. Other acceptable manufacturers include American Warming and Ventilating Inc. Model 'LE-62', United Enertech Model 'SED-5.1', Ruskin Model 'EME520DD', Louvers and Dampers Inc Model 'IL59', Atoms AP, LLC Model 'APWD-645'.

2.03 THIN LINE WALL LOUVER-TYPE - HORIZONTAL

A. Aluminum construction.

B. Maximum pressure drop of 0.3 inch S.P. at 1000 FPM free area velocity.

C. Aluminum insect screen tightly stretched and suitable braced to prevent sagging.

D. Frame shall be constructed of 6063T5 extruded aluminum of .060 inch nominal wall thickness.

E. Blades shall be constructed of 6063T5 extruded aluminum of .060 inch nominal wall thickness. Thin line style blades to be positioned at approximately a 30 degree angle on 3/4 inch centers.

F. Box frame mounting shall be used throughout with corners mitered and continuously heliarc welded. Fastenings shall be aluminum or stainless steel.

G. Finish shall be factory applied baked enamel to color as selected by Architect.

H. Thin line louvers shall be equal to Ruskin ELF211D, Greenheck EHH-201.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install wall louvers where denoted and as detailed on the Drawings.

B. Sheet Metal Contractor to verify sizes of wall louvers required prior to ordering.

C. Fasten ductwork (where required) to the louver perimeter. Bottom of ductwork shall be sloped up minimum of 30 degrees toward inside of building to control entry of water. Seal joints with silicone or polyurethane sealant.

D. Install drip pans as detailed and in locations noted on drawings.

E. Install in accordance with manufacturer's instructions.

END OF SECTION 23 37 10

SECTION 23 74 13
PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged roof top unit.

B. Unit controls.

C. Remote panel.

D. Roof mounting curb and base.

E. Maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

B. Section 23 09 13 - Instruments and Control Elements: Control components, time clocks.

C. Section ____ - ____: Placement and installation of roof mounting curbs.

D. Section 23 09 13 - Instruments and Control Elements: Installation of thermostats and other controls components.

E. Section 26 05 83 - EQUIPMENT WIRING: Installation and wiring of thermostats and other controls components; wiring from unit terminal strip to remote panel.

F. Section 26 05 83 - EQUIPMENT WIRING: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.

B. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment; 2025.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

C. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

D. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Filters: One set for each unit.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigeration compressors.

C. Provide 15-year heat exchanger on stainless steel gas-fired heat exchanger.

D. Provide 1-year warranty on all parts.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp: www.carrier.com/#sle.

B. Daikin

C. Trane, a brand of Ingersoll Rand: www.trane.com/#sle.

D. Lennox

E. Aaon

F. York International Corporation/Johnson Controls Inc: www.johnsoncontrols.com/#sle.

2.02 MANUFACTURED UNITS

A. General: Roof mounted units having gas burner and electric refrigeration.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

C. Refrigerant: R-454B OR R-32

D. Disconnect Switch: Factory mounted Non-Fused disconnect switch by unit manufacturer.

2.03 FABRICATION

A. Cabinet: Steel with baked enamel finish, including access doors with piano hinges and locking handle. Structural members shall be minimum 18 gage, 0.0478 inch, with access doors or panels of minimum 20 gage, 0.0359 inch.

B. Insulation: Minimum 1/2 inch thick neoprene coated glass fiber with edges protected from erosion.

1. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

C. Roof Mounting Curb: 14 inches high galvanized steel, channel frame with gaskets, nailer strips.

2.04 BURNER

A. Gas Burner: Induced draft type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.

B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.

C. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.

D. Supply Fan Control: Temperature sensor sensing bonnet temperatures and independent of burner controls, with provisions for continuous fan operation.

2.05 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 60335-2-40 burst test at 1775 psig.

2.06 COMPRESSOR

A. Provide minimum QTY 2 hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

B. Five minute timed off circuit to delay compressor start.

C. Provide step capacity control by hot gas by-pass.

2.07 CONDENSER COIL

A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor.

C. Provide refrigerant pressure switches to cycle condenser fans.

D. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 60335-2-40 burst test at 1980 psig.

2.08 MIXED AIR CASING

A. Dampers: Provide outside, return, and relief dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper to fall to closed position. Relief dampers may be gravity balanced.

B. Gaskets: Provide tight fitting dampers with edge gaskets.

C. Damper Operator, Units 7.5 Ton Cooling Capacity and Larger: 24 volt with gear train sealed in oil with spring return on.

2.09 OPERATING CONTROLS

A. Provide low voltage, adjustable room thermostat to control burner operation, compressor and condenser fan, and supply fan to maintain temperature setting.
   1. Include system selector switch (heat-off-cool) and fan control switch (auto-on).
   2. Locate thermostat in room as shown.

B. Provide terminal strip on unit for connection of operating controls to remote panel by others. Control shall allow for two stages of heating and two stages cooling.

C. Provide remote mounted fan control switch (on-auto).

D. Provide low limit thermostat in supply air to close outside air damper and stop supply fan.

E. Provide night control energized by central time clock to maintain lower thermostat setting, lock out refrigeration, close outside air damper and open return air damper, stop supply air fan, for night and unoccupied operation. Provide time delay to maintain outside air damper closed and return air damper open after switching to day and occupied operation.

F. Provide remote readout panels containing signal lights indicating system status, heating system failure, cooling system failure, and dirty filters; check switches proving signal light operations; system on-off switch, and cooling system on-off switch.

G. Provide in panel a manual 12 hour timer to override night control, remote damper control, low limit manual reset, and remote thermostat temperature set point.

2.10 OPERATING CONTROLS - SINGLE ZONE UNITS

A. Room thermostat shall incorporate:
   1. Automatic switching from heating to cooling.
   2. Preferential rate control to minimize overshoot and deviation from set point.
   3. Set-up for four separate temperatures per day.
   4. Instant override of set point for continuous or timed period from one hour to 31 days.
   5. Short cycle protection.
   6. Programming based on weekdays, Saturday and Sunday.
   7. Switch selection features including imperial or metric display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
   8. Thermostat must:
      a. energize both "W" and "G" when calling for heat.
      b. have capability to energize 1 or 2 stages of cooling, and 2 different stages of heating.
      c. include capability for occupancy scheduling.

B. Room thermostat display shall include:
   1. Time of day.
   2. Actual room temperature.
   3. Programmed temperature.
   4. Programmed time.
   5. Duration of timed override.
   6. Day of week.
   7. System model indication: heating, cooling, auto, off, fan auto, fan on.
   8. Stage (heating or cooling) operation.

C. Provide low limit thermostat in supply air to close outside air dampers and stop supply fan.

D. Integrated unit operation for comfort cooling, heating ventilation as well as all monitoring, recording and reporting capabilities. Controller shall also provide diagnostics and alarms of abnormal unit operation through the controller. Controller shall have an intuitive user display and be able to be used in a standalone operation or via building automation system (BAS).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 90A.

C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

D. Locate remote panels where indicated on drawings.

3.03 SYSTEM STARTUP

A. Prepare and start equipment. Adjust for proper operation.

END OF SECTION 23 74 13

SECTION 23 81 01
TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cabinet unit heaters.

B. Electric Unit heaters.

1.02 RELATED REQUIREMENTS

A. Refer to Section 01 6000 - Product Requirements

B. Commissioning
   1. Section 01 9113 - General Commissioning Requirements
   2. Section 01 9114 - Commissioning Authority Responsibility

C. Section 23 21 13 - Hydronic Piping.

D. Section 23 21 14 - Hydronic Specialties.

E. Section 23 09 93 - Sequence of Operations.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide typical catalog of information including arrangements.

C. Shop Drawings:
   1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
   2. Submit schedules of equipment including room number where unit is located, style, size and capacity for each unit being supplied.
   3. Indicate mechanical and electrical service locations and requirements.,

D. Manufacturer's Instructions: Indicate installation instructions and recommendations.

E. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

F. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

C. Capacity rated in accordance with ARI.

D. Hydronic coils shall be pressure tested to 400 psig.

1.05 WARRANTY

A. Provide 1 year manufacturers warranty for unit heater motors and cabinet heaters.

PART 2 PRODUCTS

2.01 CABINET UNIT HEATERS

A. Manufacturers:
   1. Broan
   2. Raywall

3. Markel
4. Berko
5. The Trane Company.
6. Quellet .
7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Electric Heat Coils: Nichrome elements with an open wire design, UL listed and interlocked with fan motor switch so only one power connection is required. Coil should only operate when fan is running.

C. Finish: Factory applied baked enamel of color as selected by Architect/Engineer on visible surfaces of enclosure or cabinet.

D. Disconnect Switch: Factory mount disconnect switch.

E. Control: Manufacturer shall provide unit mounted thermostat that will allow the unit to operate as a stand-alone piece of equipment.

F. Refer to schedules and drawings for unit configuration and design capacities.

G. Related Work by Others
1. Power wiring shall be part of Division 26 Work.

2.02 ELECTRIC UNIT HEATERS

A. Manufacturers:
1. Raywall.
2. Markel
3. Berko
4. Qmark, Inc.
5. Redd-i.
6. Modine.
7. Quellet, Inc.
8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Assembly: UL listed and labelled assembly with terminal box and cover, and built-in controls.

C. Heating Elements: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.

D. Cabinet: 0.0478 inch steel with easily removed front panel with integral air outlet and inlet grilles.

E. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

F. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard.

G. Motor: Permanently lubricated, sleeve bearings for horizontal models, ball bearings for vertical models.

H. Control: Unit mounted stratification thermostat with a range of 70 F to 130 F. Provide integral unit mounted power disconnect switches and thermal overload.

I. Disconnect Switch: Factory mount disconnect switch.

J. Hanger Bracket: Wall Mounted Bracket, lockable for horizontal and vertical mounting at any position.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.

C. Protection: Provide finished cabinet units with protective covers during balance of construction.

D. Cabinet Unit Heaters: Install as indicated. Coordinate to assure correct recess size for recessed units.

E. Install electric heating equipment including devices furnished by manufacturer but not factory mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals.

3.02 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

END OF SECTION 23 81 01

SECTION 23 81 26.13
SPLIT-SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air cooled condensing units.

B. Indoor ductless fan & coil units.

C. Controls.

1.02 RELATED REQUIREMENTS

A. Section 01 6000 - Product Requirements

B. Commissioning
   1. Section 01 9113 - General Commissioning Requirements
   2. Section 01 9114 - Commissioning Authority Responsibility

C. Section 26 05 83 - EQUIPMENT WIRING: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

D. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; 2010.

E. 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.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

H. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Design Data: Indicate refrigerant pipe sizing.

E. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide 1 year manufacturers warranty on parts from time of start-up.

C. Provide 5 year manufacturers warranty on compressor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier Corporation: www.carrier.com/#sle.

B. Mitsubishi Electric.

C. Daikin.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SYSTEM DESIGN

A. Split-System Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Cooling: Outdoor electric condensing unit with evaporator coils in multiple ductless indoor units ("mini-split").
   2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
   3. Provide condensate pumps with each indoor fan coil units.

B. Performance Requirements: See Drawings for additional requirements.
   1. Efficiency: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1; seasonal efficiency to ASHRAE Std 103.

C. Electrical Characteristics:
   1. See drawings for size and electrical requirements.
   2. Disconnect Switch: Factory mount disconnect switch on equipment.

2.03 INDOOR UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single point power connection with control transformer.

B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Condensate Pump for ceiling cassette units: Built in condensate pump with built-in drain sensor that shuts off unit in event of condensate pump failure.
   3. Condensate Pump for wall mounted fan coil units: Provide condensate pump with unit. Locate pump directly above unit, above the ceiling. Pump to be provided by unit manufacturer.

2.04 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
   2. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.

B. Compressor: Hermetic, two speed 1800 and 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

D. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
   1. Provide thermostatic expansion valves.

E. Operating Controls:
   1. Control by room thermostat to maintain room temperature setting.
   2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.

2.05 ACCESSORY EQUIPMENT

A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
   1. Preferential rate control to minimize overshoot and deviation from setpoint.
   2. Thermostat Display:
      a. Actual room temperature.
      b. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION 23 81 26.13

SECTION 26 01 01
GENERAL PROVISIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 11 00 - Summary of Work.

C. Refer to Section 01 23 00 - Alternates.

D. Refer to Division 23 Mechanical Specifications and to the requirements stated therein applicable to the Electrical Work, where coordination of trades is covered.

E. Refer to Division 27 Communications Specifications and to the requirements stated therein applicable to the Electrical Work, where coordination of trades is covered.

F. Refer to Division 28 Electronic Safety & Security Specifications and to the requirements stated therein applicable to the Electrical Work, where coordination of trades is covered & inclusion of Work provided.

G. The requirements of this Section shall apply to Work for Sections listed under Division 26, Electrical.

1.02 SUMMARY

A. When equipment furnished for or by the Owner is indicated on the Drawings or specified, this Contractor shall provide the proper size switches, conduit, wires, boxes, and fittings that may be required; and make connections complete. This Contractor shall verify exact requirements and locations before installation.
   1. Boxes, raceways, fittings and the like required by this contractor or any subcontractor hired by this contractor shall be coordinated by this contractor prior to footer, floor, wall, etc. types of construction for correct size

B. If the equipment, other than that which the Drawings were designed around, does not properly adapt itself to the space allotted or lend itself accessible for repair and maintenance, the Contractor shall be responsible to provide additional access panels, pipe, fittings, materials, and labor, to achieve the same end results.

C. Electrical support from bar joists shall be allowed only at panel points in top of bottom cords.
   1. Loading shall not exceed 5 pounds/S.F. or 100 pounds per panel point applied at the panel point.
   2. If support must occur between panel points, then threaded rods shall be dropped from both panel points, an adequate angle attached to both, and then the support attached to the angle as required.
   3. Suspension wires, straps, and chains such as those used to support electrical fixtures or equipment shall not be attached to or through steel roof decks.

D. The Contractor shall take field measurements necessary for his Work and shall be responsible for the accurate location and size of openings, recesses, slots, ferrules, and the like.

E. The Contractor shall be required to cooperate with "Other Trades" and other Contractors in the coordination of his Work to avoid interferences with installations by other trades and Contractors.

F. Should structural difficulties prevent the setting of cabinets or running of conduits, at points shown on Drawings, necessary minor deviations therefrom, as determined by the Architect/Engineer, may be permitted and shall be made without additional costs.

G. Extra costs which might result from deviations from the Drawings, so as to avoid interferences, shall be considered a "Job Condition" and no additional compensation will be considered applicable. In the event that such interferences occur in course of the Work, due to an error, omission, or oversight by the Contractor, no additional compensation shall be allowed. Interferences which may occur during the course of construction shall be brought to the immediate attention of the Architect/Engineer, and his decision, confirmed in writing, shall be final.

H. Installation of surface mounted trough type raceway above or below switchgear, distribution panels, and/or panelboards shall be approved by engineer prior to installation.

1.03 REFERENCES

A. Work shall be in complete accordance with codes, rules, ordinances, regulations of authorities, bodies, associations, and governments, having proper and legal jurisdiction. Specifically, the following requirements shall be met in their entirety.
   1. State and Local Rules, Regulations, Codes, Statutes, and Ordinances
   2. National Fire Protection Association applicable requirements
   3. National Board of Fire Protection
   4. National Electrical Code applicable requirements
   5. Other Codes and Standards as specifically noted in each Section of the Specifications

B. Electrical equipment shall be Underwriter's approved; also, shall meet requirements established by NEC, NEMA, and ANSI and as specified hereinafter.

C. Abbreviations of authorities used in these Specifications:
   1. NEC National Electrical Code Latest Edition adopted by the National Fire Protection Association
   2. NEMA National Electrical Manufacturers Association
   3. OSHA Occupational Safety and Health Act
   4. IES Illuminating Engineering Society Standards
   5. IPCEA Insulated Power Cable Engineers Association
   6. ANSI American National Standards Institute, Inc.
   7. FCC Federal Communications Commission
   8. EIA Electronic Industries Association
   9. NAB National Association of Broadcasters
   10. NAEB National Association of Educational Broadcasters
   11. CBM Certified Ballasts Manufacturers
   12. ITL Independent Testing Laboratories
   13. ETL Electrical Testing Laboratories
   14. UL Underwriters Laboratories
   15. DLC Design Light Consortium
   16. NICET National Institute for Certification in Engineering Technologies

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Submit shop drawings and illustrations in accordance with requirements of Section 01 30 00 - Administrative Requirements.

C. Shop Drawings (By Contractor)

1. Where limited space is available due to the nature of the Work, the requirements for shop and working drawings will apply and the Contractor is required to prepare complete shop drawings showing the exact disposition of apparatus, equipment, conduit, and the like, and its relation to the building so there will be no irregularities or interferences on this account. Shop drawings shall be prepared after coordination with other Contractors and other trades.
2. Shop drawings will not be required to be submitted for review by the Architect/Engineer, unless expressly required herein, but may be submitted when not expressly required, at the option of the Contractor.

PART 2 EXECUTION

2.01 EXPLANATION AND PRECEDENCE OF DRAWINGS

A. For purpose of clearness and legibility, the Electrical "E" drawings are essentially diagrammatic and, although size and location of equipment are closely drawn to scale whenever possible, each Contractor shall make use of the data in all of the Contract Documents and shall verify this information at the building site.

B. The Drawings indicate required size and points of termination of wiring and other related items and they may suggest proper routes for such items to conform to structure, avoid obstructions, and preserve clearances. It is not intended that Drawings indicate every necessary offset, and it shall be the Work of the Contractor to install each item in a manner as to conform to structure, avoid obstructions, preserve headroom, and keep opening and passageways clear, without further instructions or costs to the Owner.

C. It is intended that apparatus be located symmetrical with architectural elements and shall be installed at exact height and location stipulated.

D. The Contractor shall fully inform himself regarding peculiarities and limitations of the spaces available for the installation of work and materials provided under his Contract. He shall exercise due and particular caution to determine that parts of his work are made quickly and easily accessible.

E. The Contractor shall carefully examine existing conditions, existing wiring, and other materials on the premises and compare the Drawings to the existing conditions. Variances and necessary changes shall be adjusted by appropriate modifications.

2.02 PERMITS, FEES, REGULATIONS, AND INSPECTIONS

A. Unless specifically noted otherwise, the Contractor shall arrange and pay for permits, fees, and inspections required in connection with his work.

B. Work shall be inspected by approved local and state inspection bureaus, Electrical Inspection Agency or authority, and electric utility.

C. Upon completion of the Work, the Contractor shall furnish to the Architect/Engineer a certification of inspection and approval from said Bureau or Agency before final payment on contract will be allowed.

2.03 PERMANENT UTILITY CONNECTIONS

A. The Contractor shall make his own arrangements with the utility companies for connection of the permanent utilities.

2.04 HOISTS, RIGGING, TRANSPORTATION, AND SCAFFOLDING

A. The Contractor shall provide scaffolding, staging, cribbing, tackle, hoists, and rigging necessary for placing of his materials and equipment in their proper places in the Project. Temporary work shall be removed from the premises when its use is no longer required on the job.

B. The Contractor shall pay costs for transportation of materials and equipment to the jobsite and shall include such costs in his proposal.

C. Scaffolding and hoisting equipment shall comply with requirements of pertinent Federal, State, and Local Laws and Codes.

2.05 PROTECTION

A. In addition to other requirements of the Contract, the Contractor shall provide various types of protection as follows:
   1. Protect finished floors from chips and cutting oil by the use of metal chip receiving pan and an oil proof floor cover.
   2. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.
   3. Protect equipment, finished surfaces from paint droppings, insulation adhesive, and sizing droppings by use of drop cloths.

B. Switchboards, panelboards, light fixtures, and other electrical equipment shall be stored at the site with openings and bearings covered to exclude dust and moisture. Stockpiled pipe shall be placed on dunnage and protected from weather and from entry of foreign material.

C. The Contractor shall be responsible for the protection of finished work of other trades from damage or defacement by his operations and shall remedy such damage at his own expense.

2.06 EMERGENCY REPAIRS OR OPERATION

A. The Owner reserves the right to make emergency repairs and protection of the equipment and systems in operation without voiding the Contractor's guarantee bond or relieving the Contractor of his responsibility during the bonding period.

2.07 PROVISIONS FOR LATER INSTALLATIONS

A. Where Work cannot be installed as the structure is being erected, the Contractor for such Work shall provide and arrange for the building-in of boxes, sleeves, inserts, fixtures, and devices necessary to permit installation of the omitted work during later phases of construction. The Contractor shall arrange for layout, chases, holes, and other openings which must be provided in masonry, concrete, and other work.

B. The Contractor shall be responsible for informing himself of the nature and arrangement of the materials and constructions to which his work attaches or passes through.

2.08 DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEM

A. Provide a minimum of 8 hours total instruction to personnel selected by the Owner. Instructions shall include the following:
   1. Show equipment locations and explain how the various systems function, including: fire alarm system, power system, sound and lighting controls.
   2. Refer to operating instructions manual for record and clarify.
   3. Coordinate written and verbal instructions so that each is understood by personnel.

B. Provide additional instructions to Owner's personnel as stipulated in other subsections of Division 26.

2.09 FINAL COMPLETION

A. Work shall be cleaned prior to Substantial Completion of the Work.

B. Retouch or repaint factory painted prime and finish coats, where scratched or damaged. Whenever retouching will not be satisfactory, in the opinion of the Architect/Engineer, the Architect/Engineer has the option to require complete repainting until the desired appearance is obtained.

C. Remove temporary wiring as soon as permanent system(s) or portions thereof are in operating condition and have been inspected and approved.

D. Lamps, fixtures, lenses, and reflectors shall be cleaned by the Contractor no sooner than 10 days prior to Substantial Completion of the Work.

E. The Contractor shall clean equipment; restore damaged materials; remove grease, oil, chemical, paint spots, and stains.

F. On completion of his Work, the Contractor shall remove and see that each of his subcontractors removes from the site tools, equipment, surplus materials, and rubbish pertaining to his operations, and pay costs for such removal and disposition.

2.10 CUTTING AND PATCHING

A. The Contractor shall do cutting and patching of building materials and piping, as required for the installation of his Work, but no structural members shall be cut without the approval of the Architect and such cutting shall be done in a manner directed by the Architect.

B. Patching of and repair of damage to Work in place shall be done in a neat and workmanlike manner, meeting with the approval of the Architect. Contractor whose operations require cutting of work in place, or who causes damage which entails repairs of such work, shall employ mechanics of the particular trade whose work must be cut or which is damaged, and shall pay the costs of such patching or repair.

C. Conduits penetrating masonry walls shall not interrupt the vertical masonry wall reinforcing. Coordinate the location of reinforcement with Division 4. Wherever more than 2 conduits 2 inches or larger are to pass through a masonry wall in the same location or where conduits of any size in a row equals a length of 3 feet or greater, prior approval from the Architect shall be required before disturbing the wall. Wherever multiple conduits pass through masonry walls provide a minimum of 4 inches between adjacent penetrations.

D. The Contractor shall caulk around all conduit penetrations in non-fire rated wall with sealant.

2.11 GUARANTEE AND WARRANTY

A. The Contractor shall submit his and each equipment manufacturer's written certificates, warranting that each item of equipment furnished complies with the requirements of the Drawings and Specifications. The electrical system shall be warranted for one year from the date of substantial completion.

2.12 SUPERVISION AND COOPERATION

A. Work done by the Contractor under this Division shall include the services of an experienced superintendent, who shall be constantly in charge of the Work, together with the qualified journeymen, helpers, and laborers required to properly unload, install, connect, adjust, start and operate, and test the Work involved, including related equipment and materials furnished under other contracts or by the Owner.

2.13 MAINTENANCE AND OPERATING MANUALS AND INSTRUCTIONS

A. Comply with Section 01 78 00 - Closeout Submittals and the following:

B. Bind the written operating instructions, shop drawings, equipment catalog cuts, and manufacturer's instructions into the binder. Material to be assembled as follows:

1. First Page - Title of Job, Fort Loramie Local School District Board of Education, Ft Loramie Athletic Complex, 600 East Park Street, Date of Submittal, Name of Contractor, and Garmann/Miller & Associates Inc. Emergency operating instructions and/or list of service organizations (including address and telephone numbers) capable of rendering emergency service on 24 hour calls.
2. Second Page - Index

3. Third Page - Introduction to first section containing a complete written description of the system.
4. First Section - Written description of system contents, where actually located in building, how each part functions individually, and how system works as a whole. Conclude with a list of items requiring service and either state the service needed or refer to the manufacturer's data in the binder that described the proper service.
5. Second Section - A copy of each approved shop drawing (clearly marked for item furnished), with an index at the beginning of the section. Provide a separate list of lighting fixtures used on the job; list shall include, but not be limited to: Plan type, manufacturer's catalog number, and voltage, number of lamps, lamp type, ballast catalog number, manufacturer's name and quantity (when required), catalog number and quantity of any replacement glass and plastic parts.
6. Third Section - A copy of each manufacturer's operating instructions with an index at the beginning of the section.
7. Fourth Section - A list of equipment used on the job, Contractor's purchase order numbers, supplier's name and address.

C. One (1) electronic copy of the Operation and Maintenance Manuals shall be placed on a Thumb Drive, or other form of Mass Storage Device, for the Owners use. Files must be in a PDF format or format approved by the Owner.
   1. PDF shall be indexed/bookmarked to allow a quick search to the relevant material.

2.14 RECORD DRAWINGS

A. The Contractor shall keep a running record of each change and deviation from the Drawings. Records shall be kept clean and undamaged upon a set of drawings used for no other purpose. Upon completion of the Project, the Contractor shall submit to Garmann/Miller & Associates Inc. one complete set of Drawings which have been corrected to show deviations. With the submittal shall be 2 sets of prints made from the corrected Drawings for a total of 3 sets of record (as-built) drawings.

B. Record Drawings shall show:
   1. Size, type, and capacity of materials, devices, or pieces of equipment.
   2. Location of devices or pieces of equipment.
   3. Location of outlets or sources in building service systems.
   4. Routing of piping, conduit, ducts, or other building services.
   5. Actual circuit number.
   6. Actual luminaires (by manufacturer catalog number) installed.
   7. Building plan and devices shall be a scale of original construction documents.
   8. These drawings shall also record the location of concealed electric service, conduit, and other piping by indication of measured dimensions to each such line from readily identifiable and accessible walls or corners of the building.
   9. Record drawings must be complete and accurate with regard to concealed conduit, raceways, wiring, and like equipment or devices. Unless record drawings are sufficiently accurate to permit immediate location and identification of concealed work with a minimum of cutting, record drawings will be considered inadequate and the contract work deemed incomplete.

C. One (1) electronic copy of the Record Drawings shall be placed on a Thumb Drive, or other form of Mass Storage Device, for the Owners use. Files must be in a PDF format or format approved by the Owner.

END OF SECTION 26 01 01

SECTION 26 05 03
WORK IN EXISTING BUILDINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, and of Section 26 01 01 - GENERAL PROVISIONS , are included as a part of this Section as though bound herein.

1.02 SUMMARY

A. During phasing of the Work and General Construction Schedule, all existing systems, including power, lighting, fire alarm, telephone system, public address system (intercom system), etc., shall be maintained in operation, even if it requires temporary relocation, until the new work and new system is completed and operational; at which time the old work is to be removed.

B. This Contractor shall examine the existing site and familiarize himself with the existing conditions that will in any manner affect his work under this contract and include these conditions and required work in his bid.

C. General - Electrical fixtures, devices, panelboards, and other items of electrical equipment located in remodeled portions of the existing building which become obsolete or are shown to be removed, shall be disconnected and removed by the Contractor. Where existing work is removed, remove associated wiring, terminations, and obsolete exposed and interfering conduit and work.

D. Remaining lights, switches, receptacles, motors, etc., not disturbed in the remodeling shall be checked for proper operation, and circuits opened by the remodeling work shall be properly reconnected.

E. Contractor shall be responsible for cutting and patching of existing walls, floors, and ceilings required for the installation of electrical work in the remodeled portions of the existing building. Openings shall be neatly drilled or cut.

F. Patching shall be performed by a workman skilled in the trade involved, and patch work shall match the existing surface and finish in a manner acceptable to the Architect.

G. Electrical work installed in finished rooms of the existing building shall be installed in a concealed manner.

H. Painting of patched work in the existing building will be the responsibility of this Contractor.

I. Install necessary conduit and wiring for new luminaires, panelboards, outlets, and any other equipment, as indicated on the Drawings and as specified to be installed in the existing building.

END OF SECTION 26 05 03

SECTION 26 05 05
MINOR ELECTRICAL DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

1.02 RELATED REQUIREMENTS

A. Section 01 70 00 - Execution and Closeout Requirements: Additional requirements for alterations work.

B. Section 02 41 00 - Demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as indicated.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation and existing record documents.

D. Report discrepancies to Garmann/Miller & Associates Inc. before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company. It is the Electrical Contractor's responsibility to provide all site electrical disconnections required for demolition. Coordinate this work with the General Contractor.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
   2. Make temporary connections to maintain service in areas adjacent to work area.

E. Existing Fire Alarm System: Maintain existing system in service throughout construction. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Notify Owner before partially or completely disabling system.
   2. Notify local fire service.
   3. Make notifications at least 24 hours in advance.
   4. Make temporary connections to maintain service in areas adjacent to work area.

F. Existing Telephone System: Maintain existing system in service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Notify Owner at least 24 hours before partially or completely disabling system.
   2. Notify telephone utility company at least 24 hours before partially or completely disabling system.

3. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove any abandoned wire/cable found above ceiling that is not labeled for future use.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Repair adjacent construction and finishes damaged during demolition and extension work.

J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

K. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

A. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

B. Clean and repair existing materials and equipment that remain or that are to be reused.

C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION 26 05 05

SECTION 26 05 06
TEMPORARY WORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 50 00 - Temporary Facilities and Controls for additional requirements.

1.02 SUMMARY

A. Except when otherwise stipulated, completed portions of the permanent installation or materials for use in the permanent installation shall not be used in temporary work without specific permission.
   1. Installed raceways for the permanent installation may be utilized for installation of temporary wiring.

B. Overload protection and grounding for circuits and equipment of the temporary light and power system shall comply with applicable codes relating to permanent work. Panelboards and other protective equipment shall be furnished and installed as required by field conditions.

C. Contractor shall locate temporary electric service main disconnect in an approved enclosure with lock. Upon request, contractor shall arrange to daily disconnect electric power on load side of "Main(s)" and lock the enclosure(s) containing same. Solid grounding of the temporary electric service is required.

D. Provide ground fault interrupter circuit breakers for branch circuits in accord with codes and regulations, including "OSHA" and "IOSHA".

E. Lighting fixtures employed shall be of the type, quality, and quantity required to provide a temporary lighting system in accord with codes and regulations, including "OSHA" and "IOSHA", and same shall not be on the same circuits with receptacle and other devices.

F. Upon request, the Contractor shall submit shop drawings and detail information for temporary service and distribution to the Architect/Engineer for approval.

END OF SECTION 26 05 06

SECTION 26 05 19
CONDUCTORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal-clad cable.

B. Wire and cable for 600 volts and less.

C. Wiring connectors.

D. Electrical tape.

E. Wire pulling lubricant.

F. Cable ties.

1.02 RELATED REQUIREMENTS

A. Section 26 05 05 - MINOR ELECTRICAL DEMOLITION : Disconnection, removal, and/or extension of existing electrical conductors and cables.

B. Section 31 23 16 - Excavation.

C. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

D. Section 31 23 23 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

G. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

H. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

O. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

P. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing of all conduits 2" and larger and all underground conduits.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

B. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE MANUFACTURERS

A. Cerro Wire & Cable Company.

B. Encore Wire Corporation: www.encorewire.com.

C. Industrial Wire & Cable, Inc: www.iewc.com.

D. Southwire Company .

E. Alcan Cable

F. Phelps Dodge

G. General Cable

H. Colonial Wire & Cable Company

I. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:

1. All conductors on the drawings have been sized as copper conductors. The contractor may use aluminum conductors in lieu of copper for sizes 6 AWG and larger. Aluminum conductors shall be type XHHW-2. If aluminum conductor is substituted for copper conductor, size to match circuit requirements for conductor ampacity and voltage drop. The contractor shall submit to the Architect/Engineer all proposed aluminum conductors and conduits for approval for each piece of equipment or device prior to the start of rough-in. All conductors smaller than 6 AWG shall be copper.
2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.

H. Minimum Conductor Size:
1. Branch Circuits: 12 AWG.
   a. Exceptions:
      1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
      3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
2. Control Circuits: 18 AWG.

I. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
3. Color Code:
   a. 480Y/277 V, 3 Phase, 4 Wire System:
      1) Phase A: Brown.
      2) Phase B: Orange.
      3) Phase C: Yellow.
      4) Neutral/Grounded: Gray.
   b. 208Y/120 V, 3 Phase, 4 Wire System:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
      4) Neutral/Grounded: White.
   c. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:
1. Feeders and Branch Circuits:Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
   a. Size 4 AWG and Larger: Type XHHW-2.
   b. Installed Underground: Type XHHW-2.
2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.04 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding: Stranded or solid.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Aluminum or steel, interlocked tape.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
   3. Connectors for Aluminum Conductors: Use compression connectors.

C. Wiring Connectors for Terminations:
   1. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
   2. Aluminum Conductors: Use compression connectors or mechanical connectorsfor all connections.
   3. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminalsfor connections to terminal screws.

D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

G. Mechanical Connectors: Provide bolted type or set-screw type.

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.06 ACCESSORIES

A. Electrical Tape:
   1. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that raceway installation is complete and supported.

E. Verify that field measurements are as indicated.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install metal-clad cable (Type MC) in accordance with NECA 120.

D. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

G. Terminate cables using suitable fittings.
   1. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
      c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.

H. Install conductors with a minimum of 12 inches of slack at each outlet.

I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

K. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

M. Insulate ends of spare conductors using vinyl insulating electrical tape.

N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

O. In general, install EMT conduit for branch circuits throughout the building. EMT to junction box in room for lighting circuits. MC cable may be used from junction box to light fixtures. MC cable may also be used in metal stud walls for receptacles, but EMT shall still be used from the panel to a junction box in the room, between junction boxes above ceiling, and between each wall stub-out location.

P. Include an equipment ground conductor with each circuit.

Q. Provide dedicated neutrals for all circuits. Do not share neutrals.

R. Wire and cable routing indicated is approximate unless dimensioned.

S. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

T. Install wire and cable in accordance with the NECA "Standard of Installation."

U. Protect exposed cable from damage.

V. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.

W. Use suitable cable fittings and connectors.

3.04 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 26 05 19

SECTION 26 05 26
GROUNDING AND BONDING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Division 27 specifications and plans.

C. Refer to 01 23 00 - Alternates for Alternates that may affect the Work of this Section.

1.02 SUMMARY

A. Provide a complete grounding system which shall be in accordance with the National Electric Code, State and Local Ordinances, and utility company requirements, and as indicated on the Drawings.

1.03 QUALITY ASSURANCE

A. Grounding shall be in accord with NEC, Article 250, and others which apply. Equipment shall be provided with a suitable ground lug, except for distribution equipment (switchboards, panels, and the like) which shall be provided with a suitable ground bus.

B. UL 467

C. Bare solid copper conductors ASTM B3

D. Bare stranded copper conductors ASTM B8

E. Underground distribution components IEEE C2

PART 2 PRODUCTS

2.01 MATERIALS

A. Grounding connection "make-up" shall be with Erico Products Company "Cadweld", Burndy "Thermoweld", Harger "Ultraweld", or 3M of the type required at locations where a ground bus, lug, or connector is not stipulated.

B. Minimum 12 AWG 600V insulated copper equipment grounding conductor insulated with green colored insulation.

C. Stranded cable grounding electrode conductors.

D. Bare copper conductors.

E. Copper clad steel 3/4" grounding rods.

PART 3 EXECUTION

3.01 INSTALLATION

A. The following requires permanent grounds: Electrical service equipment and enclosures, conduits, and other conductor enclosures; neutral or identified conductor of interior system, main switchboard, power and lighting panelboards, control centers; noncurrent carrying metal parts of fixed equipment, such as transformers, motors, starter and controller cabinets, transfer switches, generator, instrument cases, lighting fixtures, switches, receptacles, equipment in hazardous locations; and others as indicated and/or required by NEC.

B. The grounding conductor shall be continuous wire and carried throughout the power system. Properly ground the neutral point of secondary transformers to conduit and to system ground wire. (Wire size per NEC). Grounding wire looping from transformer to transformer is not allowed.

C. Bond metallic conduit entering manholes, building service panel unit substation and building switchboard.

D. System neutral conductor shall be identified throughout and shall be grounded at the point of service only.

E. Metallic conduit shall be electrically continuous throughout and be grounded (bonded) at the service entrance. Feeder conduits (one inch and larger) shall also be grounded at pull boxes, junction boxes, cabinets, and terminal points using grounding knockouts and bushings, to the equipment grounding bar or lugs.

F. Cord connected appliance frames shall be grounded to the system grounding conductor and to the conduit system through a grounding conductor in the cord.

G. Flexible conduit connections to equipment and motors, and the like, shall have an equipment grounding conductor, size per NEC 250.

H. A green pigtail shall be installed from grounding slots of grounding outlets to system grounding conductor and to outlet box in each instance.

I. A green pigtail shall be installed from the attachment bar of toggle switches to system grounding conductor and to outlet box.

J. Green bonding jumper shall be installed in flexible metallic conduit, size per NEC 250.

K. Provide a grounding conductor, sized per NEC 250 from the ground bus at the service entrance to each side of any cold water meter; to the reinforcing bars of the concrete structure; to building; to the steel structure of the building. Similarly jumper the steel structure at building expansion joints, and "catwalks" to the steel structure.

L. Provide grounding of structural steel and ground field as denoted on the accompanying Drawings.

M. A separate equipment grounding conductor, sized in accord with NEC 250 shall be installed with each and every conduit and shall be attached to ground bars, lugs, equipment, frames, devices, pull boxes, junction boxes, outlet boxes, and the like.

N. Conduit is not an allowable grounding means.

O. Ground manholes and handholes metal components with grounding electrode and 1/0 AWG bare copper conductor, provide a ground rod.

P. Refer to Division 27 Specifications and Drawings for additional grounding and bonding requirements for Division 26.

3.02 TESTING

A. The contractor must test the primary earth ground and provide the testing results to the Engineer. The resistance shall be 5 ohms or less. If the value tested is greater than 5 ohms, additional ground rods shall be added until the test reading is 5 ohms or less.

END OF SECTION 26 05 26

SECTION 26 05 29
HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

B. Conduit and equipment supports.

C. Anchors and fasteners.

1.02 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; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 1.5. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Comply with MFMA-4.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

2.02 MANUFACTURERS

A. Threaded Rod Company

B. All-Ohio Threaded Rod Company

C. Precision Brand

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized.

C. Anchors and Fasteners:
1. Concrete Structural Elements: Use precast inserts, expansion anchors, or preset inserts.
2. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
3. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
5. Solid Masonry Walls: Use expansion anchors or preset inserts.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

J. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
2. Obtain permission from Architect before drilling or cutting structural members.

K. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

L. Install surface-mounted cabinets and panelboards with minimum of four anchors.

M. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.

N. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION 26 05 29

SECTION 26 05 50
BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

C. Refer to other Sections of Division 26 for additional detailed material and methods of Specifications.

1.02 SUMMARY

A. Load Balance and Adjustment
   1. The Contractor shall furnish personnel and equipment and insure that building power, lighting, motor, and appliance loads are balanced between phases of service entrances, distribution feeders, and panelboards as closely as possible.

B. This Contractor shall install rough-in work pertaining to his trade for each item of equipment furnished under another Section of the Specifications or by Owner. The Contractor shall, before bidding the Project, verify exact rough-in requirements before installation with the Contractor, subcontractor, Owner, or supplier furnishing said equipment, who shall furnish dimensional Drawings accurately locating rough-in for his equipment.

C. The Contractor shall rough-in and connect fixtures, equipment, appliances, and the like, requiring electric services.

D. Provide sleeves, raceways, conduit, conduit fittings, conductors, fuses, grounding equipment, devices, disconnects, starters, and protective systems required or denoted on Drawings.

1.03 SUBMITTALS

A. Comply with requirements of Section 01 3000 and Division 26 Sections.

1.04 QUALITY ASSURANCE

A. Materials shall be new, complete with manufacturer's guarantee or warranty, and shall be approved by the Underwriters' Laboratories, Inc., if a standard has been established by that agency for the type of material.

B. Materials shall also comply with applicable standards of the National Electrical Manufacturers' Association, Insulated Power Cable Engineers Association, National Safety Code, and the American Institute of Electrical Engineers. Such standards are hereby made a part of these Specifications.

C. Work shall be executed in a workmanlike manner and shall present a neat mechanical appearance when completed. Methods and techniques of installation shall be subject to the approval of the Architect.

D. Materials of the same type or class shall be the product of one manufacturer. For example, panelboards shall be from one manufacturer, lighting switches from one manufacturer.

1.05 PROJECT CONDITIONS

A. The Contractor shall be responsible for the accurate location of his Work and for informing himself of the nature and arrangement of the materials, equipment, and construction to which his Work attaches or passes through.

B. In general, piping, conduits, and other work shall be concealed in walls and above ceilings, in utility of pipe spaces, in chases, in joist spaces, in tunnels, in equipment rooms, and the like, insofar as is practical; so that such work will not interfere with the proper coordinated installation work of other trades or Contractors.

C. In general, piping, conduits, and lines, except those below slabs on grade shall be installed parallel (or at right angles) to the building walls, and at such heights as not to obstruct portions of windows, doorways, stairways, pipe space, tunnel, or passageway, and properly concealed to not interfere with the proper coordinated installation of other trades or Contractors. Where interferences develop in the field, the Work shall be offset or routed as required to clear such interferences. Consult architectural, mechanical, electrical drawings, Contractors, and other details before installing work; and unless otherwise specified, ductwork installation shall take precedence over other crafts, such as piping and conduit as determined by the Architect/Engineer.

D. Materials installed shall be new and never before used.

E. The Contractor shall procure definite locations and connections before rough-in or installation. This Contractor shall then lay out his Work and be responsible for determining proper elevations, angles, measurements, and locations required for the installation of his Work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide overcurrent protective devices in accordance with Article 240 of the National Electric Code.

B. The overcurrent protective devices must be capable of interrupting the amount of short circuit current available at their location as stated in the National Electric Code.

C. Overcurrent protective devices shall be so selected and coordinated to permit maximum continuity of service and comply with the National Electric Code.

PART 3 EXECUTION

3.01 SITE PREPARATION

A. Excavation and Backfill - Underground Wiring: The following is supplemental to the requirements of Division 31, Site Construction.

B. The Contractor shall do excavating of materials encountered, including backfilling, as shown or as necessary for the installation of underground wiring, foundations, and equipment in his Contract. Provide and maintain bracing, shoring, or sheathing necessary to support the walls of excavations.

C. Trenches shall be opened in straight lines and bottomed out at least 4 inches below conduits or ducts. Exterior trenches shall have a minimum depth of 36 inches which shall be maintained between top of largest conduit or duct and finish grade.

D. Where roots of live trees are encountered in excavations, they shall be carefully protected during construction. Contractor shall cut or remove interfering trees, remove stumps, and rocks in the line of the excavation; however, approval of the Architect shall be obtained before a tree is removed or cut. Shrubbery in line of excavation shall be removed with a ball of dirt and replaced at completion of installation.

E. Where excavation is necessary in existing pavements, Contractors for whose work the excavation is required shall pay fees and costs of opening street or pavement and costs of filling and repaving in accordance with requirements of and to the satisfaction of the Municipality, Utility, or other Owners of such paving.

F. Where existing sidewalks, drives, and roadways must be cut, they shall be cut in straight lines, shall present a neat appearance when relaid and shall match existing work. At such locations the backfill medium shall be concrete from the bottom of the finished surface to the bottom of the trench except as may be otherwise approved by the Architect/Engineer.

G. Where excavation is necessary in an existing lawn, carefully remove and store sod. After backfilling trench, replace sod or apply top dressing of black dirt and seed to match existing lawn. Care shall be exercised during the work to see that no unnecessary damage is done to lawns in the storing of dirt or other construction material. Should unnecessary damage occur, in the opinion of the Architect, the Contractor shall be required to recondition lawns at his own expense.

H. In addition, the Contractor shall provide and maintain warning barricades, flags, and warning lights, and shall conduct his work so as to create a minimum amount of inconvenience to others, traffic, construction, and the like. Temporary suspension of work does not relieve the Contractor of responsibility for the above requirements.

I. Remove and properly dispose of debris, rubbish, and excavation spoils resulting from the Work, off-site. Obtain necessary permits for dumping.

3.02 FOUNDATIONS AND ANCHOR BOLTS AND CURBS

A. The Contractor shall provide concrete pad foundations for floor mounted equipment installed under this Section. Pad foundations shall be 3-1/2 inches high minimum, unless otherwise indicated on Drawings. Edges shall be chamfered one inch. Faces shall be free of voids and rubbed smooth with carborundum block after stripping of forms. Tops of pads shall be dead level. Provide short dowel rods into floor for lateral stability and anchorage.

B. Set equipment anchor bolts in galvanized sheet metal sleeves one inch larger than bolt diameter. Secure each sleeve to a template and secure template to forms.

C. Machinery bases, bed plates, sole plates, and vibration isolation units shall be carefully aligned, shimmed, and leveled, then grouted in place with Embeco Grout (Master Builders).

D. For each surface mounted panel, provide a concrete floor curb around conduits which rise from below to the panel. Curb height shall correspond to the finish wall base material, but be not less than 3 inches high. Depth shall suit requirements but be not less than 6 inches deep (wall to face) and provide at least 2 inches concrete cover over the conduits.

3.03 INSTALLATION

A. Special care shall be taken during load balance to assure that reverse rotation of motors is not caused.

B. Materials installed under this Division of Work shall be supported from the building structure, independent of other pipe, duct, and equipment, except recessed "lay-in" fixtures not larger than 2 feet by 4 feet size may be supported as stipulated in other Divisions and Sections of Division 26.

C. Conductors and cables shall be installed in conduit and other specified raceways which have been properly supported and anchored, unless otherwise specified.

D. The Contractor shall install major and secondary control equipment and erect on approved type brackets or floor supports, located as directed, and make electric connections to major and secondary control equipment and motor or apparatus, complete, and assume full responsibility for the connections.

E. Install taps and connections in properly selected outlet boxes and junction boxes. Install pull boxes only as required. Enclosures for wiring connections of motor controllers or switches shall not be used as junction boxes for cable tapping or splicing, except where the enclosures are designed to provide space which is suitable, adequate, and approved for the purpose.

F. Cover and protect equipment, materials, enclosures, boxes, and raceways, before and after installation, to prevent injury and to prevent entrance of grit, dirt, and foreign matter.

G. Phase, neutral, and ground conductors of a given circuit must be in the same raceway. Circuiting shall be as specified and denoted on the Drawings, with loads balanced as closely as possible across all phase legs.

H. Make final electrical connections of equipment to rough-ins and the electrical system.

I. Equip outlets with fittings and outlet boxes adapted to that particular outlet.

J. Exposed outlets shall be equipped with heavy cast type boxes, such as "FS" and "FSA" type conduits. Exposed raceways in finished spaces shall be wiremold type finished to match adjacent surfaces in which case outlet boxes shall be compatible with the raceway system.

K. The ends of raceway systems and conduits shall be carefully and securely capped during construction.

3.04 ACCESS DOORS

A. Locate panels accurately in coordination with the General Construction requirements and as directed by the Architect. Panels are to be provided in unaccessible ceilings and walls where necessary to provide access to equipment and wiring as required.

3.05 DISCONNECTS

A. Provide properly sized disconnects for apparatus and equipment whenever disconnecting means is not furnished by others. Each device, apparatus, or equipment must have local disconnecting means within actual sight of the motor or apparatus, and within 49 feet of the same.

3.06 TESTING

A. Voltage and System Testing, Checking, and Reports
   1. The Contractor shall:
      a. Test and determine that system is free of short circuits and other faults.
      b. Test insulation integrity of main service cables, main branch panel feeder cables, switchgear, and transformers for 480 volt service with 1000 volt megger between phases and between each phase and ground with test maintained until readings are steady. Minimum acceptable reading is 50 megohms. Cables for lower voltages to be similarly tested, utilizing 500 volt megger. Minimum acceptable reading is 30 megohms. Transformers to be tested with 1000 volt megger. Minimum acceptable reading is 20 megohms.
   2. Contractor shall conduct such other tests and adjustments of equipment as required by Architect/Engineer or necessary to verify performance requirements. Submit data taken during such tests to Architect/Engineer. Contractor shall pay professional engineering fees involved in required testing of equipment.
   3. Electrical Contractor shall provide necessary electrical personnel and testing instruments as required to assist Architect/Engineer in testing of installation.

END OF SECTION 26 05 50

SECTION 26 05 53
IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

G. Field-painted identification of conduit.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting.

B. Section 26 05 19 - CONDUCTORS: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

C. 26 0533.13 - Conduit.

D. 26 0533.16 - Boxes.

E. 26 2413 - Switchboards.

F. 26 2416 - Panelboards.

G. 26 2726 - Wiring Devices.

H. 26 2816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
   2. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
      a. Service equipment.
      b. Industrial control panels.
      c. Motor control centers.
      d. Elevator control panels.

e. Industrial machinery.

3. For facilities equipped with generators or central battery systems, provide labeling at the service equipment in accordance with NEC Article 702.7.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

2.02 MANUFACTURERS

A. Brady Corporation.

B. Seton Identification Products.

C. HellermannTyton.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 IDENTIFICATION

A. Identification of Electrical Conduits and Raceways

1. Electrical conduit which is accessible for maintenance operations (except conduits in finished spaces) shall be identified with approved stencils or semi-rigid plastic identification pipe markers, electrical markers, or approved equal.
2. For stencils use black enamel (except white on black, red, blue or dark backgrounds). Where lines are painted, apply stenciling after the finish coat dried. Characters shall be one inch high and when dry shall be coated with clear lacquer or approved equivalent.
3. Electrical markers to be used on diameters 3/4 inch through 5 inches.
4. Electrical markers to be used on diameters 6 inches or larger (with wire bindings and seals).
5. Markers (or stencils) shall be located adjacent to each junction box, pull box, controller, panelboard, transformer, relay, and the like.
6. At Contractor's option, covers only of junction boxes shall be labeled or stenciled (in lieu of conduit) with approved permanent labels denoting voltage and circuit designation inside box (for single-phase legs, label voltage to ground; for two or more phase legs, label the phase-to-phase voltage; and combinations shall be suitably labeled).

B. Equipment Identification

1. Provide nameplates on equipment such as panelboards, distribution panels, motor starters, safety switches, control devices, and the like.
2. Lettering shall include name of equipment, the specific unit number, and reference to on/off or other instructions that are applicable.
3. Power panelboards, distribution panels, and motor control centers shall have a nameplate for each section of same and for each device contained therein, i.e., "Panel A," "Sump Pump," as is applicable.
4. Nameplates shall be laminated phenolic with a white surface and black core, unless otherwise noted. Use 1/16 inch thick material for plates up to 2 inches by 4 inches. For larger sizes use 1/8 inch thick material. Lettering of names should correspond to nomenclature specified for apparatus, corresponding with the Drawings, details, schedules, charts, wiring diagrams, and operating instructions as approved by the Architect/Engineer.
   a. Equipment fed from emergency/standby generators shall have a red surface with white core.

5. Lettering shall be condensed Gothic. The space between lines shall be equal to the width of the letters. Use 1/4 inch minimum height letters which occupy 4 to the inch. Increase letter size to 3/4 inch on largest plates.
6. In addition, feeder circuits which serve devices (panelboards, appliances) that are located remote from (more than 3 feet from) their main circuit protective device shall have approved identification installed where and as directed which indicates the origin of the power supply, feeder size, and location of main protective device, i.e., "Feeder No. 3; 4-500 MCM, 1-2 AWG Ground, 4" C.; Main Switchboard Circuit 13"; as is applicable.
7. Appliances, motors, heaters, and the like which are served by a separately mounted disconnect switch, motor starter, or combination type motor starter shall be labeled accordingly for easy identification, i.e.:
   a. Combination Starter: "HVAC-4" - "Supply Air Fan Motor"
   b. Motor at HVAC Unit: "HVAC-4" - "Supply Air Fan Motor"
   c. Disconnect Switch: "HVAC-3" - "Primary Air Heater"
   d. Heater at HV Unit: "HVAC-3" - "Primary Air Heater"
8. Nameplates to be .020 inch to .064 inch thick aluminum, not less than 3/4 inches by 2-1/2 inches or 1 inch by 3 inches, except 1-1/2 inches by 4 inches or 3 inches by 6 inches for large items. Plates shall have a colored enamel background, with etched or engraved natural aluminum lettering not less than 3/16 inch high, except 1/4 inch high for 1 inch by 3 inches and 1-1/2 inches by 4 inch plates and 1/2 inch high for 1-3/4 inches by 6 inches and larger plates (unless specifically described elsewhere in this Specification).
9. Background color shall be black,or as otherwise required. Plate shall have pressure sensitive permanent adhesive factory backing, as approved.
   a. Equipment fed from emergency/standby generators shall have a red surface with white core.
10. Note: Use 3/4 inch by 2-1/4 inch size for single gang face plates, 1-1/4 inches by 4 inches for two gang plates attached with black, round head, self threading screws, made of 1/16 inch minimum thick, laminated phenol resin sheet, with white background and black ink or lacquer filled lettering.
11. Attached directly to the apparatus in a manner approved by the Architect/Engineer.

C. Outlet Box Covers (or finishing plates)
   1. Indicate circuit numbers in box on back (box) side of cover (plate) using heavy line laundry marker pen.

D. Indexing
   1. Index each distribution center circuit and each panel circuit, clearly, neatly, and completely, including "Spares." Index shall be typewritten upon heavy card stock paper not subject to fading or mildew and shall be covered with a clear plastic window, and held securely in a suitable frame. Type date (month and year) and panel designation on each index.
   2. Each index shall be sequenced in accord with actual panel circuiting, i.e.:
      a. Left side - top to bottom - 1, 3, 5, 7
      b. Right side - top to bottom - 2, 4, 6, 8
      c. All circuits shall be visible without removing panel index.
   3. Standard index cards printed 1, 2, 3, are not acceptable.
   4. Use actual Owner provided room numbers for circuit labeling in lieu of construction room numbers. Indexes provided with the Drawings are not suitable to use as panelboard indexes.

E. Other Items
   1. Provide identification as required in other subsections of these Specifications and as denoted on the Drawings.

2.04 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
      b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
   2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
   3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
   4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
   5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
   1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

D. Locations:
   1. Each electrical distribution and control equipment enclosure.
   2. Communication cabinets.

E. Letter Size:
   1. Use 1/8 inch letters for identifying individual equipment and loads.
   2. Use 1/4 inch letters for identifying grouped equipment and loads.

2.05 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

G. Description: Cloth type wire markers.

H. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.

I. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
   2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

2.06 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:
   1. Tape for Buried Power Lines: Black text on red background.
   2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.07 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
   1. Materials:
      a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
      b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
   2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
   3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches unless otherwise indicated.

D. Description: 4 inch wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

B. Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Interior Components: Legible from the point of access.
   6. Conductors and Cables: Legible from the point of access.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

END OF SECTION 26 05 53

SECTION 26 05 55
CONNECTORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SUMMARY

A. Provide required materials for a complete system.

B. Upon request, points of junction, splices, taps, connections, pull boxes, and outlets shall be opened for inspection by Architect/Engineer or other approved authority.

PART 2 PRODUCTS

2.01 MATERIALS

A. Connectors shall be similar and equal to those manufactured by O.Z. Electrical Manufacturing Company, Burndy Engineering Company, Thomas & Betts Company.

B. Splices, taps, and other connections involving conductors not larger than No. 8 AWG max. shall be made with insulated connectors like 3M Co. "Scotchloks," Ideal Co. "Wing-Nut," or T & B Co. "Piggy" connectors. Connectors shall be wrapped with 8.5 mil heavy duty, premium grade all-weather vinyl electrical insulating tape.

C. Splices, taps, and other connections involving conductors larger than No. 8 AWG shall be made using approved compression type connectors, insulated with at least four 1/2 lap layers of 8.5 mil heavy duty, premium grade all-weather vinyl electrical insulating tape and covered overall with at least two 1/2 lap wraps of friction tape.

D. Connections or joints in wet or damp areas shall be waterproofed in an approved manner.

E. Connections of aluminum conductors are not acceptable.

F. Connectors shall be sized to carry 100 percent of the current capacity of the conductors connected. Conductors shall not be trimmed to fit a connection, the connection device shall be changed to accommodate the conductor.

G. Compression lugs shall be by T&B, O.Z. Electrical Manufacturing, or Burndy Engineering Company.

PART 3 EXECUTION

3.01 INSTALLATION

A. Splices and taps shall be made using approved mechanical connectors of the type best suited.

B. Under no circumstances will a soldered splice, tap, or connection be acceptable.

END OF SECTION 26 05 55

SECTION 26 05 83
EQUIPMENT WIRING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - CONDUCTORS.

B. Section 26 05 33.13 - CONDUIT.

C. Section 26 0526 - Grounding and Bonding

D. Section 26 05 33.16 - BOXES.

E. Section 26 27 26 - WIRING DEVICES.

F. Section 26 28 16.16 - ENCLOSED SWITCHES.

1.03 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.05 COORDINATION

A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough-in of electrical connections to coordinate with installation of equipment.

D. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 26 28 16.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 27 26.

D. Flexible Conduit: As specified in Section 26 05 33.13.

E. Wire and Cable: As specified in Section 26 05 19.

F. Boxes: As specified in Section 26 05 33.16.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
   1. Flexible conduit shall be limited to a maximum of 3'-0" in length. Provide hard pipe from junction box, disconnect, etc. to within 3'-0" of mechanical equipment termination point, provide transition to flexible conduit as necessary.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

J. Conductors on the load side of a VFD shall be routed in a dedicated conduit independent of other wiring.

END OF SECTION 26 05 83

SECTION 26 08 00
ELECTRICAL COMMISSIONING

PART 1 - GENERAL

1.01 SUMMARY

A. The Owner has contracted separately with a Commissioning Authority independent from the Architect, Engineer, and Contractors. The Commissioning Authority shall be responsible solely to the Owner and shall act as an agent of the Owner in the quality control of the project. The Commissioning Authority shall, through the Owner, have the authority to direct the Contractors to perform corrective work until final acceptance of the project by the Owner.

B. The purpose of the commissioning is to verify for the Owner that building systems have been designed and installed to meet the Owner's Project Requirements and operate per the design intent. Commissioning does not eliminate or reduce the responsibility of the design team or contractors to provide a complete and functional facility but is rather to ensure an effective transition from the construction team to the Owner.

C. Specifications have been included to define contractors' responsibilities. It is expected that each contractor participates in the commissioning process, and it is the responsibility of each contractor to provide adequate personnel to do so

1.02 RELATED DOCUMENTS

A. Section 01 91 13 – General Requirements – Commissioning

1.03 ELECTRICAL SYSTEMS / EQUIPMENT COMMISSIONED

A. Distribution Gear
B. Panelboards
C. Emergency Generator and Transfer Switches
D. Lighting and Lighting Controls

PART 2 - COMMISSIONING PROCESS

2.01 PRE-FUNCTIONAL TESTING / MANUFACTURER'S STARTUP CHECKLIST

A. The Commissioning Authority will provide pre-functional checklists. The installing contractor will complete the Pre-Functional Checklists and Manufacturer's Start-Up Checklists for each piece of equipment prior to functional testing.

B. Start-up of major Electrical Systems may be witnessed by the Commissioning Authority. The contractor shall provide the Commissioning Authority a minimum of 72 hours' notice prior to equipment start-up. The appropriate contractors and/or manufacturer's representative will be required on site to perform start-up. Start-up will be performed according to the Manufacturer's recommended procedures.

C. Startup of the Generator and Load Bank Testing shall be witnessed by the Commissioning Authority.

D. The equipment manufacturers' start-up report for the generator shall be completed and provided to the Commissioning Authority.

2.02 FUNCTIONAL TESTING

A. The Commissioning Authority will perform or witness the installing contractor or manufacturer's representative performing Functional Testing.

B. Each major system will be tested, and a random sample of each subsystem will be tested.

2.03 MASTER ISSUES LOG

A. Deficiencies noted during the commissioning process shall be documented in the Master Issues Log.

B. Contractors will be responsible for correcting deficiencies and providing written responses to the Commissioning Authority describing the date and method of resolution. If the deficiency was not corrected, the contractor shall provide an explanation as to why it was not corrected.

C. Participation in the in the commissioning process is the contractors' responsibility. Unresolved issues or a failure to provide responses to the Master Issues Log may be considered during the pay application approval process.

D. Status will be tracked for each deficiency and the Master Issues Log will be updated accordingly.

E. The Commissioning Authority will perform limited rechecks of discrepancies after written notification has been received from the contractor that corrections are complete. The cost of subsequent rechecks, if necessary, will be charged directly to the contractor at the hourly rate of the Commissioning Authority.

PART 3 - EXECUTION

3.01 RESPONSIBILITIES OF ELECTRICAL CONTRACTOR

A. The Contractor shall provide the Commissioning Authority assistance as necessary to gain access to the construction site for the purpose of verifying that the installation of materials and equipment is performed in accordance with the contract documents. This shall include the use of keys, ladders, power lifts and other specialized equipment where necessary.

B. Assure participation of major equipment manufacturers in appropriate startup, training, and testing activities.

C. Participate in commissioning specific meetings scheduled by the Commissioning Authority or Construction Manager.

D. Complete pre-functional checklist for Commissioning Authority review.

E. Assist the Commissioning Authority as necessary during functional testing.

F. Provide owner training per the project specifications.

G. The contractor shall submit to the Commissioning Authority the following Reports:
   1. Megger Report
   2. Switchgear Cx Startup Report

3. Main Breaker GFCI Report
4. Power System Study

H. The contractor shall ensure the main service max available fault current sticker is placed on the service entrance, per the requirements of NEC 110.24.

I. It is the specific responsibility of each contractor to complete all equipment setup, testing, calibration, loop tuning, and related functions prior to Commissioning. The Contractor shall complete all required checklists and certify in writing that these tasks have been accomplished and that the systems are ready for commissioning.

J. The Electrical Contractor shall remove and replace covers and doors from all power distribution equipment and motor control enclosures as requested by the Commissioning Authority for the purpose of verifying feeder, overcurrent device ratings and general installation. Electrician shall gain access to interior of all power distribution equipment enclosures including distribution equipment related to mechanical or kitchen equipment. The electrician may be requested to access this equipment while the power is energized. Appropriate Personal Protective Equipment is the responsibility of the electrical contractor.

K. The Commissioning Authority will perform thermographic imaging of the electrical system panels, switchgear, and critical equipment and connections. After Owner occupancy, the Electrical Contractor shall return to the site and remove and replace all covers and doors from all power distribution equipment and motor control enclosures as requested by the Commissioning Authority. The electrician is requested to access this equipment while the power is energized. Appropriate Personal Protective Equipment is the responsibility of the electrical contractor.

L. Standby Generator Testing: Electrical contractor shall provide a minimum of 48 hours' notice prior to the emergency generator startup and load bank test, as performed by a manufacturer's representative. If proper notice is not provided, the electrical contractor shall bear the cost of reproducing the startup and testing procedures in the presence of the Commissioning Authority. The building main shall be disconnected while the automatic transfer switch is observed for proper switching. The generator, as well as building emergency systems, such as egress lighting, shall be observed for proper operation during startup and testing. If applicable contractor shall refill fuel tank after test. Provide a copy of the manufacturer's startup report for Commissioning Authority review.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - HANGERS AND SUPPORTS.

C. Section 26 05 53 - IDENTIFICATION: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2009.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches; National Electrical Manufacturers Association; 1993.

F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.

G. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

H. NEMA PB 1 - Panelboards; 2011.

I. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

L. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

M. UL 67 - Panelboards; Current Edition, Including All Revisions.

N. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittal Procedures

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 MAINTENANCE MATERIALS

A. See Section 01 60 00 - Product Requirements, for additional provisions.

B. Furnish two of each panelboard key.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Square D

B. Siemens.

C. Eaton

D. General Electric

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating: As indicated on drawings.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.

3. Fronts:
    a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
1. Phase and Neutral Bus Material: Aluminum or copper.
2. Ground Bus Material: Aluminum or copper.

D. Circuit Breakers:
1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:
1. Provide surface-mounted enclosures unless otherwise indicated.
2. Substitutions: See Section 01 60 00 - Product Requirements.

F. Description: NEMA PB 1, circuit breaker type.

G. Minimum integrated short circuit rating: As indicated on the Drawings.

H. Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole; UL listed. For air conditioning equipment branch circuits provide circuit breakers UL listed as Type HACR.
1. Coil operating voltage: 120 volts, 60 Hz.
2. Coil operating voltage: 120 volts, DC.
3. Size as shown on Drawings.
4. Provide unit mounted control power transformer, RED indicating light in front cover.

I. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

J. Cabinet Front: Surface type, fastened with concealed trim clamps, hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum or copper.
3. Ground Bus Material: Aluminum or copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Provide clear plastic circuit directory holder mounted on inside of door.

F. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

G. Provide an isolated ground bar in designated panelboards.

H. Minimum Integrated Short Circuit Rating: As indicated on the Drawings.

I. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.
1. Type HACR for air conditioning equipment circuits.
2. Class A ground fault interrupter circuit breakers where scheduled.
3. Do not use tandem circuit breakers.

J. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole.

K. Enclosure: NEMA PB 1, Type 1.

L. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards.

M. Cabinet Front: Flush cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
2) 14,000 rms symmetrical amperes at 480 VAC.
b. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
3. Conductor Terminations:
a. Provide mechanical lugs unless otherwise indicated.
b. Provide compression lugs where indicated.
c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I. Provide grounding and bonding in accordance with Section 26 05 26.

J. Install all field-installed branch devices, components, and accessories.

K. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.

L. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

M. Provide filler plates to cover unused spaces in panelboards.

N. Provide computer-generated circuit directory for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Revise directory to reflect circuiting changes required to balance phase loads. Identify spares and spaces.

O. Provide identification nameplate for each panelboard in accordance with Section 26 05 53.

P. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.
   1. Minimum spare conduits: 4 empty 1 inch.

Q. For facilities equipped with generators or central battery systems, provide labeling at the service equipment in accordance with NEC Article 702.7. Reference Section 26 05 53 - IDENTIFICATION for additional information.

3.02 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for additional requirements.

B. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.03 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 10 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION 26 24 16

SECTION 26 27 01
ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Permanent electrical service

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SYSTEM DESCRIPTION

A. System Characteristics: 208Y/120 volts, three phase, four-wire, 60 Hertz.

B. Service Entrance: Electrical contractor to provide conduits from service pole to pad mounted transformer as indicated on the Drawings.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Building primary transformer to be provided by the utility company. Transformer pad to be provided by the electrical contractor per the utility company's requirements.

B. The electrical contractor shall provide the feed from the secondary of the utility transformer to the main switchboard. Refer to the Drawings for requirements.

1.05 QUALITY ASSURANCE

A. Utility Company: Coordinate electric service requirements with utility company prior to installation.

B. Perform work in accordance with utility company written requirements and NFPA 70.

C. Products: Listed and classified by as suitable for the purpose specified and indicated.

1.06 PRE-INSTALLATION MEETING

A. Convene one week prior to commencing work of this section. Review service entrance requirements and details with Utility Company representative.

PART 3 EXECUTION

2.01 PREPARATION

A. Arrange with utility company to obtain permanent electric service to the Project.

B. Verify that field measurements are as indicated on utility company drawings.

2.02 INSTALLATION

A. Coordinate the installation of primary conduits with the local utility company, reference the electrical site plan for additional information.

B. Install electrical utility meter to local utility company's requirements, reference the electrical site plan for additional information.

C. Provide secondary feeders from utility transformer to building switchboard. Turn conduits up at utility transformer, coordinate work with utility company prior to rough-in. Primary connections to the utility transformer by the utility company, secondary connections to the utility transformer by the Electrical Contractor.

D. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

E. Concrete pads, transformer vaults or fiberglass assemblies for transformers shall be set so top of pad, vault or assembly is no more than 6" above finish grade at the transformer location.

END OF SECTION 26 27 01

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates.

D. Floor box service fittings.

E. Poke-through assemblies.

1.02 RELATED REQUIREMENTS

A. Section 26 05 33.16 - BOXES.

B. Section 26 0526 - Grounding and Bonding

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.06 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements for additional provisions

B. Furnish two of each style, size, and finish wall plate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cooper

B. Arrow Hart

C. Pass & Seymour

D. Hubbell

E. Leviton

2.02 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide tamper resistant receptacles for receptacles educational facilities and as required by NEC.

E. Provide GFCI protection for receptacles installed within 6 feet of sinks and as required by the NEC.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

H. Provide GFCI protection for receptacles serving electric wash fountains.

2.03 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Finishes: Refer to Drawings.

2.04 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20and where applicable FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Wall Switches: Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
   1. Body and Handle: Plastic with toggle handle.
      a. Voltage: 120 volts, AC.
      b. Current: 20 amperes.
   2. Ratings: Match branch circuit and load characteristics.

C. Switch Types: Single pole, double pole, 3-way, and 4-way.

2.05 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498and where applicable FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

2. NEMA configurations specified are according to NEMA WD 6.

B. Receptacles: Heavy duty, complying with NEMA WD 6 and WD 1.
   1. Device Body: Plastic.
   2. Configuration: NEMA WD 6, type as specified and indicated.
   3. Prewired pigtail connectors that accommodate Fed Spec receptacles are approved. Must be crimped and welded terminal application connector.

C. Convenience Receptacles: Type 5 - 20 equal to Hubbell 5362, Cooper BR20, or Pass & Seymour CR20W.
   1. Prewired pigtail receptacles: Type 5 - 20 equal to Pass & Seymour PT5362, Hubbell SNAP5362, Leviton lev-lok, or Cooper ArrowLink.

D. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

2.06 TECHNOLOGY OUTLETS

A. Provide rough-ins as indicated on the Drawings.

2.07 WALL PLATES

A. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Cover Plates: Smooth stainless steel.

C. Weatherproof covers to be metal hinged covers that allows cord to be plugged in with cover closed.

2.08 FLOOR BOX SERVICE FITTINGS

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
   2. Thomas & Betts Corporation; _____: www.tnb.com/#sle.
   3. Wiremold, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Refer to drawings for information.

2.09 POKE-THROUGH ASSEMBLIES

A. Manufacturers:
   1. Hubbell Wiring Devices - Kellems: www.hubbell-wiring.com.
   2. Thomas & Betts Corporation: www.tnb.com.
   3. Wiremold Company: www.wiremold.com.
   4. Substitutions: See Section 01600 - Product Requirements.

B. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Modular wiring devices are seen as an acceptable alternative at the discretion of the contractor. Receptacles must meet UL498 and Federal Specification WC-596 requirements. Switches must meet UL20 and Federal Specification WC-896 requirements. Prewired terminal application pigtail connectors must be crimped and welded.

G. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

H. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

I. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

J. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

K. Install wiring devices plumb and level with mounting yoke held rigidly in place.

L. Install wall switches with OFF position down.

M. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

N. Do not share neutral conductor on branch circuits utilizing wall dimmers.

O. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

P. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

Q. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

R. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

S. Connect wiring device grounding terminal to outlet box with bonding jumper.

T. Install standard plates on switch, receptacle, and blank outlets in finished areas.

U. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 05 37 to obtain mounting heights specified.

B. Mounting heights refer to bottom of box.

C. Install wall switch 44 inches above finished floor.

D. Install convenience receptacle 16 inches above finished floor, UNO.

E. Install convenience receptacle 4 inches above backsplash of counter, UNO.

F. Install dimmer 44 inches above finished floor.

G. Install telephone jack 16 inches above finished floor, UNO.

H. Install telephone jack for side-reach wall telephone to position top of telephone at 44 inches above finished floor.

I. Install telephone jack for forward-reach wall telephone to position top of telephone at 48 inches above finished floor.

3.05 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Verify that each receptacle device is energized.

E. Test each receptacle to verify operation and proper polarity.

F. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.07 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

SECTION 26 43 01
SURGE PROTECTIVE DEVICES AND POWER QUALITY

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 26 24 16 - PANELBOARDS.

1.02 REFERENCES

A. IEEE C62.41 – Surge Voltages in Low-Voltage AC Power Circuits.

B. IEEE C62.45 – Low-Voltage AC Power Circuits, Guide on Surge Test.

C. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).

D. NEMA LS-1 – Low Voltage Surge Protective Devices.

E. UL 1283 – Electromagnetic Interference Filters.

F. UL 1449 – Surge Protective Devices.

1.03 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. VPR: Voltage Protective Rating.

1.04 SUBMITTALS

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

B. Product Data: For each type of product indicated, include rated capacities, unit dimensions, operating weights, operating characteristics, furnished specialties, and accessories.

C. Product Performance: For surge protective devices, certified by an independent testing agency for compliance with UL, IEEE, and NEMA standards.

D. Product Certificates: For surge protective devices, signed by product manufacturer certifying compliance with the following standards:
   1. UL 1283
   2. UL 1449 (4th Edition)
   3. IEEE (62.41)
   4. IEEE (62.45)

E. Operation and Maintenance Data: For surge protective devices to include in emergency, operation, and maintenance manuals.

F. Warranties: Special warranties specified in this Section.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain surge protective devices and accessories through one source from a single manufacturer.

B. Third Party Testing: Performance testing and ratings shall be documented by an independent testing agency nationally recognized for the type of testing required.

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 IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits."

E. Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449, "Surge Protective Devices."

1.06 PROJECT CONDITIONS

A. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:
   1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage and in compliance with test and evaluation procedures outlined in the nominal discharge surge current test of UL 1449 4th Edition section 37.7.3. MCOV values claimed based on component values or on the 30 minute 115% operating voltage test, section 38 of UL 1449 will not be accepted.
   2. Operating Temperature: 30 to 120 degrees F.
   3. Humidity: 0 to 85 percent, noncondensing.
   4. Altitude: Less than 20,000 feet above sea level.

1.07 COORDINATION

A. Coordinate location of field-mounted surge protective devices to allow adequate clearances for maintenance. Surge protective devices may be externally mounted to the switchboard and/or panelboard.

B. Circuit breakers for externally mounted surge protection device shall be sized per manufacturer's recommendations.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge protective device that fail in materials or workmanship within ten years from the date of substantial completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Square D.

B. Cutler Hammer.

C. General Electric.

D. Siemens.

E. Surge Suppression Inc.

F. Current Technology, Inc.

G. Liebert

H. Intermatic

I. Advanced Protection Technologies, Inc.

J. LEA International

K. Mersen

L. APF - Active Power Filter

M. PQI - Power Quality International

N. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SERVICE ENTRANCE SUPPRESSORS

A. Surge Protective Device Description: Single or multiple module design with field-replaceable module(s), sine-wave-tracking type with the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Redundant suppression circuits.
4. Arrangement with copper bus bars and for connections to phase buses, neutral bus, and ground bus.
5. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
6. LED indicator lights for power and protection status.
7. Audible alarm, with silencing switch, to indicate when protection has failed.
8. One set of dry contacts rated at 5 amp, 250 volt AC, for remote monitoring of protection status.
9. Surge-event operations counter.
10. Type 1 or Type 2 SPD per UL 1449 4th Edition.

B. Peak Single-Impulse Surge Current Rating: 200 kA per mode.

C. Connection Means: Permanent wired.

D. Protection modes and UL 1449 Voltage Protective Rating (VPR) based on the 6kV 3kA surge for grounded wye circuits with voltages of 277/480 volt and 120/208 volt, 3 phase, 4-wire circuits shall be as follows:
1. Line to Neutral: 900 V for 277/480Y; 600 V for 120/208Y
2. Line to Ground: 1000 V for 277/480Y; 600 V for 120/208Y
3. Neutral to Ground: 1000 V for 277/480Y; 900 V for 120/208Y

2.03 DISTRIBUTION PANELBOARD SUPPRESSORS

A. Surge Protective Device Description: Modular design with field-replaceable modules, sine-wave-tracking type with the following features and accessories:
1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Redundant suppression circuits.
4. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
5. LED indicator lights for power and protection status.
6. Audible alarm, with silencing switch, to indicate when protection has failed.
7. One set of dry contacts rated at 5 amp, 250 volt AC, for remote monitoring of protection status.
8. Surge-event operations counter.
9. Type 1 or Type 2 SPD per UL 1449 4th Edition.

B. Peak Single-Impulse Surge Current Rating: 150 kA per mode.

C. Protection modes and UL 1449 Voltage Protective Rating (VPR) based on the 6kV 3kA surge for grounded wye circuits with voltages of 277/480 volt, 120/208 volt, 3 phase, 4-wire circuits shall be as follows:
1. Line to Neutral: 900 V for 277/480Y; 600 V for 120/208Y
2. Line to Ground: 1000 V for 277/480Y; 600 V for 120/208Y
3. Neutral to Ground: 1000 V for 277/480Y; 900 V for 120/208Y

2.04 SUPPRESSORS FOR PANELBOARDS

A. Surge Protective Device Description: Sine-wave-tracking type, panel-mounted design with the following features and accessories:
1. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
2. LED indicator lights for power and protection status.
3. Audible alarm, with silencing switch, to indicate when protection has failed.

4. One set of dry contacts rated at 5 amp, 250 volt AC, for remote monitoring of protection status.

B. Peak Single-Impulse Surge Current Rating: 80 kA per mode.

C. Protection modes and UL 1449 Voltage Protective Rating (VPR) based on the 6kV 3kA surge for grounded wye circuits with voltages of 277/480 volt, 120/208 volt, 3 phase, 4-wire circuits shall be as follows:
   1. Line to Neutral: 900V for 277/480Y and 600V for 120/208Y.
   2. Line to Ground: 1000V for 277/480Y and 600V for 120/208Y.
   3. Neutral to Ground: 1000V for 277/480Y and 900V for 120/208Y.

D. Protection modes and UL 1449 Voltage Protective Rating (VPR) based on the 6kV 3kA surge for 120/240 volt, 1 phase, 3-wire circuits shall be as follows:
   1. Line to Neutral: 600 V
   2. Line to Ground: 600 V
   3. Neutral to Ground: 900 V

2.05 ENCLOSURES

A. NEMA 4 maximum, NEMA 250 minimum.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install devices at service entrance on line or load side, with ground lead bonded to service entrance ground.

B. Install devices for panelboard and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length and in no case shall conductors exceed 5 feet in length. Do not bond neutral and ground.

3.02 FIELD QUALITY CONTROL

A. Testing: Perform the following field tests and inspections and prepare test reports:
   1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with requirements.
   2. Complete startup checks according to manufacturer's written instructions.
   3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low Voltage Surge Protective Devices." Certify compliance with test parameters.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 26 43 01

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Exit signs.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding

B. Section 26 05 29 - HANGERS AND SUPPORTS.

C. Section 26 05 33.16 - BOXES.

1.03 REFERENCE STANDARDS

A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.

C. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type); 2002.

D. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

F. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 101 - Life Safety Code; 2015.

I. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Submittal Procedures

B. Shop Drawings: Indicate dimensions and components for each luminaire.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Conform to requirements of NFPA 70 and NFPA 101.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS - LUMINAIRES

A. As indicated on the Drawings.

B. Substitutions: See Section 01 60 00 - Product Requirements except where individual luminaire types are designated with substitutions not permitted.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

G. Support luminaires larger than 2 x 4 foot size independent of ceiling framing.

H. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

I. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

J. Grid Ceilings: Fasten luminaires to ceiling grid members using suitable clips.

K. Install recessed luminaires to permit removal from below.

L. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Drawings.

M. Install accessories furnished with each luminaire.

N. Connect luminaires and exit signs to branch circuit outlets provided under Section 26 05 37 using flexible conduit.

O. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

P. Bond products and metal accessories to branch circuit equipment grounding conductor.

Q. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

R. Install lamps in each luminaire.

3.02 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection in accordance with Section 01450 and 01451

D. Operate each luminaire after installation and connection to verify proper operation.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.03 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and adjust fixtures as indicated.

C. Position exit sign directional arrows as indicated.

3.04 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.05 PROTECTION

A. Relamp luminaires that have failed lamps at Substantial Completion.

3.06 SCHEDULE - SEE DRAWINGS

END OF SECTION 26 51 00

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 05 29 - HANGERS AND SUPPORTS.

C. Section 26 05 33.16 - BOXES.

1.03 REFERENCE STANDARDS

A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.

C. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type); 2002.

D. IES RP-8 - Roadway Lighting; 2014.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

F. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittal Procedures

B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 COORDINATION

A. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. As indicated on the Drawings.

2.02 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Install accessories furnished with each luminaire.

G. Bond products and metal accessories to branch circuit equipment grounding conductor.

H. Provide concrete bases for lighting poles at locations indicated, in accordance with Section 03 30 00 - Cast-in-Place Concrete,

I. Install poles plumb.
   1. Provide shims to adjust plumb.
   2. Grout around each base.

J. Install lamps in each luminaire.

K. Bond luminaires, metal accessories, and metal poles to branch circuit equipment grounding conductor.

3.02 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection, testing, and adjusting in accordance with Section 01 40 00.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.03 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.04 SCHEDULE - SEE DRAWINGS

END OF SECTION 26 56 00

SECTION 26 05 33.13
CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Intermediate metal conduit (IMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

G. Conduit fittings.

1.02 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating.

B. Section 26 05 26 - GROUNDING AND BONDING.
   1. Includes additional requirements for fittings for grounding and bonding.

C. Section 26 05 29 - HANGERS AND SUPPORTS.

D. Section 26 05 53 - IDENTIFICATION.

E. Section 26 05 33.16 - BOXES.

F. Section 27 10 00 - Structured Cabling: Additional requirements for communications systems conduits.

G. Division 27 - Communications.

H. Division 28 - Electronic Safety and Security.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.

C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); 2005.

D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

G. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2005.

H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.

J. NFPA 70 - National Electrical Code; National Fire Protection Association; Most recent edition adopted by Authority Having Jurisdiction, including all applicable Amendments and Supplements.

K. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

L. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

M. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

N. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

P. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

Q. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.

B. Communications Systems Conduits: Also comply with Section 27 05 33.13 - Conduit for Communications Systems.
   1. Use extra large mogul rigid conduit bodies to allow large bending radius of technology cabling.

C. Fittings for Grounding and Bonding: Also comply with Section 26 05 26 - GROUNDING AND BONDING.

D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

E. Provide products listed, classified, and labeled as suitable for the purpose intended.

F. Coordinate painting requirements with painting contractor where conduits are exposed due to open structure and the like.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

H. Conduit Size: Comply with NFPA 70.
   1. Minimum size: 1/2" unless otherwise specified.

I. Underground Installations:

1. PVC conduit may be used for underground installations. Where underground conduit (2" and larger) passes under a parking lot, driveway, roadway, or the like; encase conduit in concrete.

J. Outdoor Locations Above Grade: Use rigid steel conduit.

K. Wet and Damp Locations: Use rigid steel or intermediate metal conduit.

L. Dry Locations:
   1. Concealed: Use rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.
   2. Exposed: Use rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.

M. In addition to raceways for Division 26 work, the electrical contractor shall provide raceway systems for Division 27 - Communications and Division 28 - Electronic Safety and Security as noted to the Drawings. When raceway requirements are not specifically noted in the electrical legends or the floor plans, Division 26 shall coordinate size and routing with the system installer prior to installation. Systems shall be installed in conduit inside walls, and for spaces with open structures. Raceway for open spaces shall be routed from rough-in box, to an adjacent space with an accessible ceiling, or to the cable tray if tray is routed through the space. Refer to Section 28 31 01 - Fire Alarm Detection System for additional raceway requirements related to fire alarm.

N. Where underground conduit enters a room and water entering through the conduit is a concern or an issue, provide a product similar to Raychem Rayflate Duct Sealing System at both ends of conduit to seal conduit air and water tight.

O. Where conduit penetrates a wall to a room below grade, utilize a product similar to Link-Seals to provide a watertight seal around the outside of the conduit.

2.02 MANUFACTURERS

A. Essex Group

B. Hubbell Power Systems

C. Hellermann Tyton

D. Wheatland Tube Company

E. Allied Tube and Conduit

F. Cantex Inc.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

C. Conduit Size: Comply with NFPA 70.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

C. Description: Interlocked steel construction.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

C. Description: Interlocked steel construction with PVC jacket.

2.07 ELECTRICAL METALLIC TUBING (EMT)

A. Thin wall conduit shall be Underwriter's approved electrical metallic tubing (EMT). EMT shall meet Federal Specification WW 806, latest edition.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression (gland) or set-screw type.
a. Do not use indenter type connectors and couplings.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Nonmetallic conduit shall be Underwriter's approved Schedule 40 heavy wall "PVC" polyvinyl chloride plastic type, properly supported and anchored. Conduit shall be terminated in end-bells or bushings. Provide bonding or grounding conductors in accordance with NEC.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

D. Description: NEMA TC 2; Schedule 40 PVC.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify routing and termination locations of conduit prior to rough-in.

E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

A. In finished rooms with open structure, conduit shall be concealed. If the structure is such that conduit cannot be concealed, the contractor shall review with the Architect and Engineer prior to installation.

1. In rooms such as gymnasiums, student dining, extended learning and the like with exposed open ceiling structure, exposed conduit shall be limited to within the space of 6" below bottom of structural steel, to within 4" of the roof deck. Conduit shall not be routed exposed on the wall below this area.

B. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

C. Install EMT conduit for branch circuits throughout the building. EMT to junction box in room for lighting circuits. MC cable may be used from junction box to light fixtures. MC cable may also be used in metal stud walls for receptacles, but EMT shall still be used from the panel to a junction box in the room , between junction boxes above ceiling, and between each wall stub-out location.

D. Branch circuits may be routed underslab. In no case may conduits be routed within the slab.

E. PVC conduit may be used for underground installations. Use metal rigid elbows with metal rigid above grade. Fiberglass elbows with zero burn-through, high strength/UV resistant reinforced epoxy may be used for large utility and electrical sweeps in lieu of the rigid. PVC conduits (2 inches and larger) that are routed outside the building under driveways, roadways, sidewalks or the like shall be incased in concrete.

F. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.

G. Install nonmetallic conduit in accordance with manufacturer's instructions.

H. Arrange supports to prevent misalignment during wiring installation.

I. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

J. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

K. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29 - HANGERS AND SUPPORTS.

L. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

M. Do not attach conduit to ceiling support wires.

N. Arrange conduit to maintain headroom and present neat appearance.

O. Route exposed conduit parallel and perpendicular to walls.

P. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

Q. Maintain adequate clearance between conduit and piping.

R. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

S. Cut conduit square using saw or pipecutter; de-burr cut ends.

T. Bring conduit to shoulder of fittings; fasten securely.

U. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

V. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations.

W. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch size.

X. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

Y. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic and expansion joints.

Z. Provide suitable pull string in each empty conduit except sleeves and nipples.

AA. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

BB. Identify conduit under provisions of Section 26 05 53 - IDENTIFICATION.

END OF SECTION 26 05 33.13

SECTION 26 05 33.16
BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Floor boxes.

D. Wall and ceiling outlet boxes.

E. Pull and junction boxes.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - HANGERS AND SUPPORTS.

B. Section 26 27 26 - WIRING DEVICES:
   1. Wall plates.
   2. Poke-through assemblies.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.

F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Project Record Documents: Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
   2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use suitable concrete type boxes where flush-mounted in concrete.
   4. Use suitable masonry type boxes where flush-mounted in masonry walls.
   5. Use raised covers suitable for the type of wall construction and device configuration where required.
   6. Use shallow boxes where required by the type of wall construction.
   7. Do not use "through-wall" boxes designed for access from both sides of wall.
   8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
   9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
   10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
   11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
   12. Wall Plates: Comply with Section 26 27 26.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
   1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
   2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
   3. Junction and Pull Boxes Larger Than 100 cubic inches:
      a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

2.02 MANUFACTURERS

A. Appleton Electric.

B. Arc-Co./Division of Arcade Technology: www.arc-co.com.

C. Unity Manufacturing: www.unitymfg.com.

D. Hubbell

E. Thomas and Betts

F. Crouse-Hinds - Eaton

G. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
   2. Concrete Ceiling Boxes: Concrete type.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

C. Wall Plates for Finished Areas: As specified in Section 26 27 26.

D. Technology rough-in boxes to be extra deep (min 2-1/2").

2.04 FLOOR BOXES

A. Type as specified on Drawings.

2.05 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Coordinate locations of outlets with other trades prior to rough-in.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

E. Install boxes plumb and level.

F. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
      a. For boxes installed in masonry walls, use fittings equal or similar to Raco Block-Loc to hold box flush, plumb and level.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

G. Install boxes as required to preserve insulation integrity.

H. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

I. Close unused box openings.

J. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

K. Provide grounding and bonding in accordance with Section 26 05 26.

L. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

M. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

N. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
1. Adjust box locations up to 3 feet if required to accommodate intended purpose.

O. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.

P. Maintain headroom and present neat mechanical appearance.

Q. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

R. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

S. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

T. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

U. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
1. Switch outlets shall be located within 12" of latch side of door opening, nearest to the opening.

V. Use flush mounting outlet box in finished areas.

W. Coordinate the installation of flush mounted boxes in masonry walls with the Masonry Contractor to achieve neat openings.

X. Do not install flush mounting boxes back-to-back in walls; provide minimum 8 inches separation.

Y. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

Z. Use stamped steel bridges to fasten flush mounting outlet box between studs.

AA. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

BB. Use adjustable steel channel fasteners for hung ceiling outlet box.

CC. Do not fasten boxes to ceiling support wires.

DD. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

EE. Use gang box where more than one device is mounted together. Do not use sectional box.

FF. Use gang box with plaster ring for single device outlets.

GG. Use cast outlet box in exterior locations exposed to the weather and wet locations.

HH. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

II. Set floor boxes level.

JJ. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted metal box in other locations.

3.03 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

3.04 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

B. Clean exposed surfaces and restore finish.

END OF SECTION 26 05 33.16

SECTION 26 05 33.23
SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface metal raceways.

B. Surface raceway systems.

C. Wireways.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - GROUNDING AND BONDING

B. Section 26 05 29 - HANGERS AND SUPPORTS.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.

D. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

E. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 SURFACE RACEWAYS

A. Surface Metal Raceway: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.
   1. Size - As indicated on the Drawings.
   2. Finish: white, to be painted to match wall color - painting by others.
   3. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories.
   4. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

B. Refer to electrical drawings for surface raceway types and detail.

2.02 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

2.03 RACEWAY REQUIREMENTS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.
   1. Finish: as indicated above.

2.04 SURFACE RACEWAY SYSTEMS

A. Manufacturers:
   1. Legrand
   2. Hubbell
   3. MonoSystems

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Surface Metal Raceways: Listed and labeled as complying with UL 5.

D. Install raceways plumb and level.

E. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

F. Wireway Supports: Provide steel channel as specified in Section 26 0529.

G. Close unused raceway openings.

3.02 WIREWAYS

A. Description: Lay-in wireways and wiring troughs with removable covers; listed and labeled as complying with UL 870.

B. Wireway Type, Unless Otherwise Indicated:
   1. Indoor Clean, Dry Locations: NEMA EN 10250, Type 1, painted steel with screw-cover.
   2. Outdoor Locations: NEMA EN 10250, Type 3R, painted steel with screw-cover.

C. Finish for Painted Steel Wireways: Manufacturer's standard grey unless otherwise indicated.

D. Where wireway size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

3.03 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.

C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.

D. Verify that conditions are satisfactory for installation prior to starting work.

E. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.

F. Secure and support raceways in accordance with Section 26 05 29 at intervals complying with NFPA 70 and manufacturer's requirements.

G. Provide grounding and bonding in accordance with Section 26 05 26.

3.04 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for additional requirements.

B. Inspect raceways for damage and defects.

C. Correct wiring deficiencies and replace damaged or defective raceways.

3.05 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 PROTECTION

A. Protect installed raceways from subsequent construction operations.

END OF SECTION 26 05 33.23

SECTION 26 28 16.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonfusible switches.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - HANGERS AND SUPPORTS.

B. Section 26 0526 - Grounding and Bonding

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA (INST) - NECA Standard of Installation; National Electrical Contractors Association; 1993.

C. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association; 2002 (R2007).

D. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

E. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 3000 - Submittal Procedures

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Project Record Documents: Record actual locations of enclosed switches.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Square D

B. Siemens.

C. Cutler Hammer

D. General Electric

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

A. Nonfusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
   1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
   2. Handle lockable in OFF position.

B. Enclosures: NEMA KS 1.
   1. Interior Dry Locations: Type 1.

2. Exterior Locations: Type 3R.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

3.02 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for additional requirements.

B. Perform field inspection in accordance with Section 01 4500 and 01 4510

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

E. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

END OF SECTION 26 28 16.16

SECTION 27 05 26
GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SECTION INCLUDES

A. Bonding & Grounding

1.03 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions and the sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. This Specification covers the following sections from the 2025 OSDM:
   1. 27 0526 - Grounding & Bonding for Communications Systems

1.04 SYSTEM DESCRIPTION

A. The bonding and grounding system shall be capable of supporting the ground reference

B. The system shall consist but not limited to the following:
   1. RBB - Rack Bonding Busbars
   2. TBC - Telecommunications Bonding Conductor
   3. Bonding Conductors
   4. Bonding Connectors
   5. Labeling system

1.05 DESCRIPTION OF WORK

A. Provide labor, material, equipment, and accessories necessary for operation of a complete bonding/grounding system for telecommunications. The cabling contractor shall furnish the equipment, accessories, and necessary materials as described herein and system Drawings.
   1. There are one (1) Telecommunications Rooms
      a. Telecommunications Room A115
         1) Provide wiring system in unit per Drawings, Schedules, and this Specification.

1.06 QUALITY ASSURANCE

A. All components and equipment shall be listed by Underwriters Laboratories, Inc. for network use, and the components shall bear the UL label. The system shall be installed in accordance with requirements set by the 2023 National Electrical Code.

B. Installing contractor must have a minimum of 5 years experience in network installations and utilize data cable installation technicians.

C. The contractor shall employ on his staff at least one Registered Communications Distribution Designer (RCDD) registered with the Building Industries Consulting Services International (BICSI) or be certified by the manufacturer of the cable solution for both copper and fiber systems.

D. The contractor shall submit with his bid the name, registration number, and seal of the RCDD on the contractor's staff or provide certificates from manufacturer of the cable solution for both copper and fiber systems.

E. The RCDD or factory trained designer shall review all design documents including these bid Specifications and provide in writing with the contractors bid, certification of this review, and shall note any and all discrepancies that the RCDD believes are of material concern to the completion of a fully operating system.

F. The RCDD or factory trained designer shall certify the final installation in writing and provide written verification that he/she has inspected the completed installation and that the installation meets the terms and conditions of this Specification, design requirements of the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual), and all EIA/TIA, NFPA, NEC, and all local codes and Specifications related to this work.

G. All design documents, submittals, as-built Drawings, test results, and other documentation provided by the contractor shall bear the name, registration number, and seal of the RCDD responsible for this bid.

1.07 CERTIFICATION

A. The contractor shall provide the services of a network cabling company and provide equipment listed by Underwriters Laboratories, Inc. The contractor shall issue an equipment certification stating that the equipment and connected wiring and devices which form the specified system, together with installation are in compliance with the requirements established by ANSI/EIA J-STD-607-C, EIA/TIA 568, B.1, B.2, B.3, 569, the 2023 National Electrical Code and the BICSI 14th Edition TDMM.

1.08 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section. **No cabling shall be installed prior to this meeting.**
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Fort Loramie Local School District Board of Education - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.09 SUBMITTALS

A. Prior to commencement of work.
   1. Shop Drawings -Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
      a. The contractor shall be responsible for furnishing engineering Drawings which indicate the interlocking of equipment and wiring external to the various patch panels. These Drawings shall be included in the submittal to the Architect/Engineer Technology Designer for approval.
      b. Complete and comprehensive shop Drawings shall be submitted to the Architect/Engineer Technology Designer for review.
      c. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.
      d. The contractor shall submit a schematic of the proposed bonding and grounding system outlining connectivity, landing locations of conductors on busbars, and components to be provided. Catalog cut sheets are required for busbars, bonding & grounding conductors, and all connectors (6 awg & above) used in the bonding system to the Architect/Engineer Technology Designer for review.

2. Provide documentation of on-staff RCDD or verifiable manufacturer certification and conformance with all of Article 1.06 Quality Assurance.

B. Post Construction
   1. Provide a complete wiring diagram of the system. Typicals, and the like, will not be acceptable. Include 1/8 inch = 1'-0" scale Drawings of the system layout. These diagrams shall conform to Article 1.06 Quality Assurance.
   2. Include three (3) printed copies of all test data for the bonding & grounding system. Also, provide two (2) CD ROMs/digital copies containing the test data with any utility programs that may be necessary to view the data.
   3. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect's technology designer.
   4. Operation & Maintenance Manuals
      a. Provide complete O & Ms. One hard copy and PDF format.
      b. Both formats shall be fully indexed with tabs by Section Name/System/Device.

1.10 WARRANTY

A. Components, parts, and assemblies supplied by the cabling contractor/manufacturer shall be guaranteed against defects in materials and workmanship for a period of 20 years, commencing upon system start-up and beneficial use, provided such defects are not caused by a misuse, abuse, neglect, unauthorized tampering, equipment modifications, or acts of God. Warranty services shall be provided by the installer of the equipment manufacturer during normal working hours. The representative shall be based in a fully staffed branch office and located within a reasonable distance from the job site. An adequate supply of repair parts shall be maintained by the branch office. The manufacturer shall not be liable for consequential damages. The manufacturer's statement of warranty shall be included in the submittals.

1.11 ADDITIONAL REQUIREMENTS

A. Provide three copies of Record Drawings (As-builts) upon completion (with no more than a month after completion) of the project, the Record Drawings shall be submitted to the Architect/Engineer Technology Designer for approval.

1.12 EXTRA MATERIALS

A. Maintenance Stock
   1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      a. 12AWG equipment Bonding jumpers and compression connectors with tool.

B. Obtain Owner's signature acknowledging receipt of extra stock.

PART 2 PRODUCTS

2.01 EQUIPMENT RACKS

A. Provide a copper horizontal bonding busbar kit for each rack from the rack manufacturer. Provide a 6 AWG bonding connection from the each busbar to a C-Type compression Tap to the aisle bonding conductor. Land the 6 AWG conductor on bonding busbar with a 2-hole connector.

B. Provide Products compatible with the rack manufacturers provided by 27 1100 Communication Equipment Room Fittings :

2.02 BONDING AND GROUNDING DEVICES

A. Telecommunications Bonding Conductor (TBC)
   1. Bonding to the service equipment (power) ground

a. The bonding conductor for telecommunications shall bond the PBB to the service equipment (power) ground.

2. Sizing the bonding conductor for telecommunications
   a. The bonding conductor for telecommunications shall be, as a minimum, the same size as the main electrical system earth grounding conductor. For PBBs located more than 100 feet from the Main Electrical busbar where the primary earth ground is located, refer to drawings for sizing.

B. The Secondary Bonding Busbar (SBB) is the common central point of connection for telecommunications systems and equipment in the location served by that Telecommunications Room or Main Equipment Room.
   1. Provide a SBB in each Telecommunications Room and in any additional spaces where Telecommunications Enclosures are present and where specified on drawings.
      a. The SBB shall:
         1) Be a predrilled copper busbar provided with standard BICSI bolt hole sizing and spacing for the type of connectors to be used, and have minimum dimensions of 1/4 inch thick x 2 inches wide and 20 inches in length to meet the application requirement with consideration of future growth.
         2) Approved Manufacturers:
            (a) Erico TGB - A20L12PT
            (b) Harger TGBI14220TGB
            (c) Panduit GB2B0312TPI-1
         3) The busbar shall be electrotin-plated for reduced contact resistance.
      b. Bonding Conductor Connectors
         1) The BBC conductor to utilize 2-hole compression type connectors with 7/16" holes, 1" apart (center to center). Provide connectors, 3/8" stainless steel bolts, washers and locknuts to land connectors on the busbars.
         2) Building Steel Bonding conductor, cable tray bonding conductor, and aisle (Racks) bonding conductor to utilize 2-hole compression type connectors with 5/16" holes, 5/8" apart (center to center). Provide connectors, 1/4" stainless steel bolts, washers, and locknuts to land connectors on the busbars.

C. Bonding/Grounding for Telecommunications Enclosures (TEs)
   1. Provide a bonding/grounding kit and conductors for each Telecommunications Enclosure.
      a. The bonding/grounding kit shall:
         1) Be a predrilled copper busbar with bolt hole sizing and spacing for the type of connectors to be used.
         2) Be connected to building steel via a 6 AWG copper bonding conductor connection with the bonding kit at the enclosure and an exothermic weld to the building steel, or universal beam grounding clamp. (Panduit GUBC500-G or equal).
      b. Bonding Conductor Connectors
         1) Building Steel Bonding conductor to utilize 2-hole compression type connectors with 1/4" holes, . Provide connectors, 1/4" stainless steel bolts, washers, and locknuts to land connectors on the enclosure bonding connection/busbar.

PART 3 EXECUTION

3.01 CABLE PULLING AND INSTALLATION

A. The equipment racks shall be completely installed before any cables are pulled.

B. Cable pathways outside of the cable tray must be supported by "J" hooks or an approved support for category cabling. "O" rings will not be acceptable. The distance between cabling supports shall not exceed 48".

C. Bonding /Grounding Conductors shall be segregated from communications cabling 27 1513 Horizontal Communications Cabling at a minimum of 6" or by a physical barrier of the same manufacture as the cable tray. Separate pathways are preferred which may be attached to the cable tray.

D. Contractor shall take measures to avoid unsupported bundles of cables hanging over unprotected edges of cable trays etc. during all phases of construction.

E. No cable may be pulled between the holes of the cable tray. Cables must exit over the top of the side rail of the cable tray. Provide waterfall devices to maintain bend radius.

F. Cables are not to be run through conduits or sleeves without bushings installed. Any cabling pulled through conduit or sleeves without bushings must be removed and a new cable pulled.

G. It is not recommended to install cabling in rooms where painting is incomplete. Cabling contractor is responsible to take protective measures to assure cabling is not painted. Any cable found to have paint must be cleaned in its entirety or be replaced.

H. Cable installed in areas with exposed ceilings must be concealed within conduit. Technology rooms are the only exception.

I. Cable ties and tape are NOT permitted for securing cable coils or supporting cabling in any way during installation, be it temporary or permanent, on any indoor cabling.

J. Cable ties may only be used to secure cabling outdoors. Cable tie ends shall be cleanly cut with flush cutters.

K. Cables shall be bound with non-printed Velcro straps. Plenum rated Velcro must be used above ceiling.

3.02 LABELING AND MARKING

A. Contractor shall follow the 2023 National Electrical Code and the ANSI/TIA/EIA-606-B Standard for labeling.

3.03 GROUNDING AND BONDING PRACTICES

A. All systems installed under these contracts shall comply fully with ANSI EIA/TIA J-STD 607-C or the most recent revision at time of release of bid documents and the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual) as they relate to bonding and grounding systems.

B. All bonding conductors and connectors shall be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL).

C. All bonding conductors shall be insulated and copper. The minimum bonding conductor size shall be a No. 6 AWG. Refer to Drawings for details.

D. Bonding conductors should not be placed in ferrous metallic conduit. If it is necessary to place bonding conductors in ferrous metallic conduit, the conductors shall be bonded to each end of the conduit with a conductor sized as a No. 6 AWG, minimum.
   1. All metallic duct or sleeve banks shall be bonded together with No. 6 AWG bonding conductors if any sleeve or duct is a part of the bonding system.

E. Labels, Color-Coding, and Markings
   1. Each telecommunications bonding conductor shall be labeled. Labels shall be located on conductors as close as practicable (i.e., ease of access to read the label) to their point of termination. Labels shall be nonmetallic and include the information below:
      a. Far end Type Termination
         1) PBB-Room Number
         2) SBB - Room Number
      b. Near End (at Busbar) Type Termination

1) BLDN Steel
2) For SBBs, BBC -PBB Room Number
3) For PBBs, BBC - SBB Room Number
4) TBC for electric bonding conductor for PBB
5) MGN - Panel Number for SBBs
6) Rack Number for Telecommunications Racks
7) TEL for Telephone Lightning Arrestors
8) CATV for Cable static discharge block
9) ANT-system name, i.e. NTP GPS, clock xmitter, Channel 1, DAS, etc.)

2. Refer to ANSI/TIA/EIA 606-B for additional labeling requirements.
3. Each telecommunications bonding conductor shall be marked appropriately by a distinctive green color.

F. It is the responsibility of this contractor to provide grounding and bonding of the technology racks and cabling system to comply with the BICSI guidelines in the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual).
1. Provide a SBB in each Telecommunications Room and associated bonding conductors.
2. All PBBs and SBBs shall have a layer of Anti Corrorsion Conductive Lubricant between each connector and busbar.

3.04 TELECOMMUNICATIONS BONDING CONDUCTOR (TBC)

A. Bonding to the service equipment (power) ground
1. The bonding conductor for telecommunications shall bond the PBB to the service equipment (power) ground.

B. Sizing the bonding conductor for telecommunications
1. The bonding conductor for telecommunications shall be, as a minimum, the same size as the BBC. Refer to Drawings for sizing.

3.05 TESTING - BONDING AND GROUNDING SYSTEM

A. The telecommunications grounding and bonding system shall be tested with an earth ground resistance tester using the Two Point Test Method.

B. The following will be needed to test the grounding and bonding.
1. An earth ground resistance tester with the attachments.
2. All testing should be done with the entire building in operation. Nothing needs to be shut down to test the grounding and bonding with this tester.
3. If the resistance value is less than 0.1 Ohm between the two test points the bonding is adequate.

C. Tests to be conducted:
1. The installer / technician conducting these tests must be certified in the use of the Earth Ground Resistance Test equipment.
2. Test between the PBB and the service equipment (power) ground. - TBC Test
3. Test between the PBB and each SBB in the system.
4. Test between the PBB/SBB and:
a. Data racks
b. Cable tray
5. Tests shall be conducted with the systems in operation.
6. Tests shall be recorded and submitted to the Architect/Engineer Technology Designer.

3.06 THE SECONDARY BONDING BUSBAR (SBB)

A. Rules for bonds to the SBB

1. BBCs and other SBBs within the same space shall be bonded to the SBB with a conductor as specified above.
2. The bonding conductor between a BBC and SBB shall be continuous and routed in the shortest possible straight-line path.
3. Where a panel board for telecommunications is located within the same room or space as the SBB, that panel board's ACEG bus (when equipped) or the enclosure shall be bonded to the SBB.
4. The SBB shall be as close to the panel board as is practicable and shall be installed to maintain clearances required by applicable electrical codes.
5. Where a panel board for telecommunications is not located within the same room or space as the SBB, consideration should be given to bonding the panel board's ACEG bus (when equipped) or the enclosure to the TGB.

B. As a minimum, bond SBB to following:
1. Building Steel, (minimum No. 2/0 AWG insulated copper bonding conductor). Exothermic Weld Bonding Conductors to Building Steel.
2. Local Service Panel Ground (minimum No. 1/0 AWG insulated copper bonding conductor) unless larger is specified in the Drawings.
3. Telecommunications Conduit(s) Entering TR (minimum No. 6 AWG insulated copper bonding conductor).
4. No. 2 AWG Aisle insulated copper bonding conductor for each aisle of telecommunication racks.

C. Connections to the SBB
1. Connections of BBCs to the SBB shall utilize listed 2-hole compression connectors.

D. Installation Considerations
1. The SBB shall be insulated from its support. A 50 mm (2 in) separation is recommended.
2. A practical location for the SBB is to the side of the panel board (where provided). The vertical location of the SBB should take into consideration whether the grounding and bonding conductors are routed in an access floor or overhead cable tray.

3.07 BONDING TO THE METAL FRAME OF A BUILDING

A. All bonding conductors and connectors for bonding the metal frame of a building shall be listed for the purpose intended and approved by a NRTL.

B. Each PBB and SBB shall be bonded to the metal frame within the room using a No. 2/0 AWG conductor via an exothermic weld.

C. When practicable because of shorter distances and other considerations, and where horizontal steel members are permanently electrically bonded to vertical column members, TGBs may be bonded to these horizontal members in lieu of the vertical column members.

3.08 TRAINING

A. Provide as a part of this contract/bid a total of (4) four hours of on-site training and demonstration of the new system to the Owner's staff.

B. Demonstrate and explain:
1. Bonding/Grounding methods and maintenance.
2. Labeling schemes
3. All points of grounding/bonding in the system.

END OF SECTION 27 05 26

SECTION 27 11 00
COMMUNICATION EQUIPMENT ROOM FITTINGS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SECTION INCLUDES

A. Wall Mount Cabinets

B. Horizontal Cable Management

C. Vertical Cable Management

D. Power Strips (Two Post)

E. Blank Panels

1.03 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions and the sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Division 01 for Alternates that may affect the Work of this Section.

C. This Specification addresses Technology Room Fitting required by equipment in the following sections from the 2025 OSDM:
   1. 27 2100 - Data Network Equipment
   2. 27 2133 - Wireless Data Communication Equipment
   3. 27 3150 - Telephone System
   4. 27 4119 - Video Display Equipment
   5. 27 4125 - Video On-Demand System
   6. 27 5123 - Central Sound and Paging System
   7. 27 5313 - Clock System
   8. 28 1601 - Access Control/Intrusion Detection
   9. 27 2300 - CCTV Camera System

1.04 SYSTEM DESCRIPTION

A. The communication room fittings products provide the basic structure for mounting and installation of communication equipment.

B. The Communication equipment room fittings system shall consist but not limited to the following:

1.05 DESCRIPTION OF WORK

A. Provide labor, material, equipment, and accessories necessary for operation of a complete system. The contractor shall furnish the equipment, accessories, and necessary materials as described herein and system Drawings.
   1. There are one (1) Telecommunications Rooms
      a. Telecommunications Room A115
         1) Provide TR Fittings system in unit per Drawings, Schedules, and this Specification.

1.06 QUALITY ASSURANCE

A. All components and equipment shall be listed by Underwriters Laboratories, Inc. for network use, and the components shall bear the UL label. The system shall be installed in accordance with requirements set by the 2023 National Electrical Code.

B. Installing contractor must have a minimum of 5 years experience in computer network cable installations and utilize data cable installation technicians.

C. The contractor shall employ on his staff at least one Registered Communications Distribution Designer (RCDD) registered with the Building Industries Consulting Services International (BICSI) or be certified by the manufacturer of the cable solution for both copper and fiber systems.

D. The contractor shall submit with his bid the name, registration number, and seal of the RCDD on the contractor's staff or provide certificates from manufacturer of the cable solution for both copper and fiber systems.

E. The RCDD or factory trained designer shall review all design documents including these bid Specifications and provide in writing with the contractors bid, certification of this review, and shall note any and all discrepancies that the RCDD believes are of material concern to the completion of a fully operating system.

F. The RCDD or factory trained designer shall certify the final installation in writing and provide written verification that he/she has inspected the completed installation and that the installation meets the terms and conditions of this Specification, design requirements of the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual), and all EIA/TIA, NFPA, NEC, and all local codes and Specifications related to this work.

G. All design documents, submittals, as-built Drawings, test results, and other documentation provided by the contractor shall bear the name, registration number, and seal of the RCDD responsible for this bid.

1.07 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section. **No cabling shall be installed prior to this meeting.**
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Fort Loramie Local School District Board of Education - Technology Coordinator

B. 75% Project Completion
   1. Begin holding one (1) hour Division 27 weekly project progress meeting On-Site or Remote.
      a. Attendance required:
         1) Division 27 Contractor and contractor's on-site project manager
         2) Related Subcontractors
         3) Garmann Miller Technology Designer
         4) Construction Manager
      b. Topics of Discussion
         1) Any and all lead time issues.
         2) Any issue that would prevent project from being completed on scheduled project completion date. All issues not correctable by Division 27 but other Divisions

must be submitted in writing to General Contractor (GC) and or Construction Manager at Risk (CMR) within 24 hours of meeting ending.

3) All outstanding issue from previous week.

2. Refer to Division 1 Front-End documents for additional requirements.

1.08 SUBMITTALS

A. Prior to commencement of work.

1. Shop Drawings -Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
   a. The contractor shall be responsible for furnishing engineering Drawings which indicate the interlocking of equipment and wiring external to the various patch panels. These Drawings shall be included in the submittal to the Architect/Engineer Technology Designer for approval.
   b. Complete and comprehensive shop Drawings shall be submitted to the Architect/Engineer Technology Designer for review.
   c. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.

B. Post Construction

1. Operation & Maintenance Manuals
   a. Provide complete O & Ms. One hard copy and PDF format.
   b. Both formats shall be fully indexed with tabs by Section Name/System/Device.
2. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.09 WARRANTY

A. Components, parts, and assemblies supplied by the contractor/manufacturer shall be guaranteed against defects in materials and workmanship for a period of 20 years, commencing upon system start-up and beneficial use, provided such defects are not caused by a misuse, abuse, neglect, unauthorized tampering, equipment modifications, or acts of God. Warranty services shall be provided by the installer of the equipment manufacturer during normal working hours. The representative shall be based in a fully staffed branch office and located within a reasonable distance from the job site. An adequate supply of repair parts shall be maintained by the branch office. The manufacturer shall not be liable for consequential damages. The manufacturer's statement of warranty shall be included in the submittals.

1.10 ADDITIONAL REQUIREMENTS

A. Provide three copies of Record Drawings (As-builts) in addition to the requirements under Front-End requirements. Upon completion (with no more than a month after completion) of the project, the Record Drawings shall be submitted to the Architect/Engineer Technology Designer for approval.

PART 2 PRODUCTS

2.01 HORIZONTAL WIRE MANAGEMENT

A. Provide horizontal wire management in racks as indicated on the Drawings.

B. Horizontal cable manager shall be front & rear, 2RU with covers per Drawings. 19 in. rack system width.

C. Approved Manufacturers: Same manufacturer as racks.

2.02 VERTICAL WIRE MANAGEMENT

A. Provide wire management as indicated on Drawings.

1. Vertical wire management
    a. Approved Manufacturers:
        1) Panduit PRV6 with wire management covers (front & rear), Panduit PRSHD6
        2) Hoffman ECC6DF45UA (Black) with wire management covers (front & rear), Hoffman ECC6CVL45UB
        3) Chatsworth 13912-703 (cover is incl)
        4) Great Lakes
    b. All cabling shall be supported within the wire management.

2.03 POWER STRIPS (TWO POST AND WALL MOUNT CABINETS)

A. Provide two horizontal power strips on each rack. Mount power strips near midpoint in the rack with one plugged into rack convenience outlet and the second plugged into the UPS Outlet. Power strips to be 12-14-outlets, NEMA 5-15R. Power strips to be equipped with a minimum 10' power cord with NEMA L5-20P and 20A circuit breaker and NEMA L5-30P and 30A breaker for UPS loads. (Provide extension/adapters as required). Power strip shall be equipped with an AC current meter.
    1. One strip to be connected to each rack's 20A convenience outlet.
    2. Second strip to be connected to output of Rack UPS (provided by the Data Network Equipment Contractor).
    3. Approved Manufacturers 20A Power Strip:
        a. Tripp-Lite PDUMH20
        b. APC AP7801B
        c. Cyberpower PDU20M2F10R
    4. Approved Manufacturers 30A Power Strip
        a. APC AP7802B
        b. Tripp-Lite PDUMH30
        c. Cyberpower PDU15B2F12R
    5. Label Power Strip inputs with ANSI-606-B compliant labels as "UPS (30A)" and "Gen Only (20A)".

2.04 WALL MOUNT CABINETS

A. Wall-mount cabinets manufactured from steel sheet. Non-seismic applications - Maximum equipment weight of 300 lb when secured to the structural wall with standard anchors.

B. EIA compliant 19" cabling wall mount rack with a useable depth of 30inches.

C. Weight capacity shall be 200 lbs minimum.

D. Center section and back pan shall be 16-gauge steel minimum, phosphate pre-treated and finished in a black textured powder coat and lockable.

E. Rackrail shall be constructed of 11-gauge steel with tapped 12-24 mounting holes in universal EIA spacing with black powder coat finish.

F. Rack shall include cable management.

G. Rack shall have ½", 2" and 3" electrical knockouts on the top and bottom of the back pan.

H. Rack shall be constructed to swing open for component cabling access, center section shall pivot for either left or right opening. Large opening on back pan shall have a 12-1/2" x 12-1/2" cutout for electrical pull-box.

I. Top and bottom side vents to accommodate a fan cooling kit.

J. Rack shall be UL Listed in the US and Canada to the UL-2416 (NWIN) Category when used with bonding kit.

K. Be manufactured by an ISO 9001 and ISO 14001 registered company.

L. Rack shall be warrantied to be free from defects in materials or workmanship under normal use and conditions for the lifetime of the rack.

M. Rack shall have a lockable tempered glass or plexi glass door.

N. Provide fan kit.
   1. By the same manufacture.
   2. Fan Kit shall feature a minimum of two fans and diplace a minimum of 95CFM of free air.

O. Rack shall have 26RU of rack space and a usable depth of 30 inches.

P. Provide grounding and bonding kit and bond to the TMGB.

Q. Approved Manufactures
   1. Basis of design: Chatsworht Products - 12419-X48
   2. Equals by: Panduit PanZone, Middle Attlantic, Tripp Lite, Great Lakes

PART 3 EXECUTION

3.01 INSTALLATION

A. Floor treatment must be installed in Telecommunications rooms prior to rack installation.

B. The equipment racks shall be completely installed before any cables are pulled.

C. Cable ties and tape are NOT permitted for securing cable coils or supporting cabling in any way during installation, be it temporary or permanent, on any indoor cabling.

D. Cable ties may only be used to secure cabling outdoors. Cable tie ends shall be cleanly cut with flush cutters.

E. Cables shall be bound with non-printed Velcro straps. Plenum rated Velcro must be used above ceiling.

F. Coordinate with HVAC contractor for hot/cold aisle configuration.

G. Coordinate with the 27 0526 Bonding and Grounding Contractor.

H. Coordinate with the electrical contractor for lighting/cable tray within racks, and AC outlets on racks and communication backboards.

3.02 LABELING AND MARKING

A. Contractor shall follow the 2023 National Electrical Code and the ANSI/TIA/EIA-606-B Standard for labeling.

B. Contractor shall mark all racks with appropriate permanent printed adhesive labels approved by the Architect/Engineer Technology Designer in accordance with Owner's requirements and Drawings. In addition to adhesive labels, the jacks shall be color coded as directed.

C. Refer to T Drawings for approved rack, outlet & patch panel labeling scheme.
   1. Coordinate with CM and Owner so room numbers in labeling scheme match final room numbers.

3.03 TRAINING

A. Provide as a part of this contract/bid a total of (2) two hours of on-site training and demonstration of the new system to the Owner's staff.

B. Demonstrate and explain:
   1. Labeling Scheme
   2. Product use and product features

END OF SECTION 27 11 00

SECTION 27 13 23
COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SECTION INCLUDES

A. Backbone single mode fiber cable

B. Backbone outside plant single mode fiber cable

C. Innerduct/fabric duct pathway

1.03 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions and the sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Division 01 for Alternates that may affect the Work of this Section.

C. This Specification covers the following sections from the 2025 OSDM:
   1. 27 1323 - Communications Optical Fiber Backbone

D. This Specification addresses backbone optical cabling required by equipment in the following sections from the 2025 OSDM:
   1. 27 2100 - Data Network Equipment

1.04 SYSTEM DESCRIPTION

A. The optical backbone system shall be capable of supporting 10 Gbps full-duplex transmission for multimode and 80Gb/s for single mode fiber utilizing a combination of single-mode fiber 8.7/125 cable. The system must comply with EIA/TIA 568-B-5 standard and 568B.1, B.2, B.3 requirements for color-coding.

B. The voice and data cabling system shall consist but not limited to the following:
   1. Local Area Network Fiber Backbone
   2. Wide Area Network Fiber Backbone
   3. Single mode Fiber Optic Cabling
   4. Telecommunications Bonding and Grounding System

1.05 DESCRIPTION OF WORK

A. Provide labor, material, equipment, and accessories necessary for operation of a complete fiber backbone system. The cabling contractor shall furnish the equipment, accessories, and necessary materials as described herein and system Drawings.
   1. There are one (1) Telecommunications Rooms
      a. Telecommunications Room A115
         1) Provide wiring system in unit per Drawings, Schedules, and this Specification.

B. The Technology work for cabling shall include, but not limited to, the following:
   1. Provide fiber patch panels.
   2. Provide and terminate cabling within each room, telecommunications enclosures, and in the data racks.
   3. Provide and terminate fiber optic cables where indicated.

C. The single-mode and multi-mode fiber optic cables shall be terminated directly into bulkheads with fusion-spliced, factory-polished, "SC-APC" type Splice-On connectors.

1.06 QUALITY ASSURANCE

A. All cabling components and equipment shall be listed by Underwriters Laboratories, Inc. for network use, and the components shall bear the UL label. The system shall be installed in accordance with requirements set by the 2023 National Electrical Code.

B. Installing contractor must have a minimum of 5 years experience in network cable installations and utilize data cable installation technicians.

C. The contractor shall employ on his staff at least one Registered Communications Distribution Designer (RCDD) registered with the Building Industries Consulting Services International (BICSI) or be certified by the manufacturer of the cable solution for both copper and fiber systems.

D. The contractor shall submit with his bid the name, registration number, and seal of the RCDD on the contractor's staff or provide certificates from manufacturer of the cable solution for both copper and fiber systems.

E. The RCDD or factory trained designer shall review all design documents including these bid Specifications and provide in writing with the contractors bid, certification of this review, and shall note any and all discrepancies that the RCDD believes are of material concern to the completion of a fully operating system.

F. The RCDD or factory trained designer shall certify the final installation in writing and provide written verification that he/she has inspected the completed installation and that the installation meets the terms and conditions of this Specification, design requirements of the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual), and all EIA/TIA, NFPA, NEC, and all local codes and Specifications related to this work.

G. All design documents, submittals, as-built Drawings, test results, and other documentation provided by the contractor shall bear the name, registration number, and seal of the RCDD responsible for this bid.

1.07 CERTIFICATION

A. The cabling contractor shall provide the services of a network cabling company and provide equipment listed by Underwriters Laboratories, Inc. The cabling contractor shall issue an equipment certification stating that the equipment and connected wiring and devices which form the specified system, together with installation have a 20-year Application Assurance Product Warranty for a 10/100 Gigabit Ethernet Solution, and are in compliance with the requirements established by EIA/TIA 568, B.1, B.2, B.3, 569, and BICSI Standards.

1.08 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section. **No cabling shall be installed prior to this meeting.**
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Fort Loramie Local School District Board of Education - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.09 SUBMITTALS

A. Prior to commencement of work.
   1. Shop Drawings -Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
      a. The contractor shall be responsible for furnishing engineering Drawings which indicate the interlocking of equipment and wiring external to the various patch panels. These Drawings shall be included in the submittal to the Architect/Engineer Technology Designer for approval.
      b. Complete and comprehensive shop Drawings shall be submitted to the Architect/Engineer Technology Designer for review.
      c. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.
   2. Provide documentation of on-staff RCDD or verifiable manufacturer certification and conformance with all of Article 1.06 Quality Assurance.
   3. If a product is manufacturer discontinued, provide the manufacturer recommended direct replacement cut sheet and note as "Replacement for discontinued item".

B. Post Construction
   1. Contractor to submit training syllabus to the Architect/Engineer Technology Designer for approval at least two weeks prior to commencement of training sessions.
   2. Provide a complete wiring diagram of the system. Typicals, and the like, will not be acceptable. Include 1/8 inch = 1'-0" scale Drawings of the system layout. These diagrams shall conform to Article 1.06 Quality Assurance.
   3. Include three (3) printed copies of all test data for the cabling system. Also, provide two (2) CD ROMs/digital copies containing the test data with any utility programs that may be necessary to view the data.
   4. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect's technology designer.
   5. Operation & Maintenance Manuals
      a. Provide complete O & Ms. One hard copy and PDF format.
      b. Both formats shall be fully indexed with tabs by Section Name/System/Device.
   6. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.10 WARRANTY

A. Components, parts, and assemblies supplied by the cabling contractor/manufacturer shall be guaranteed against defects in materials and workmanship for a period of 20 years, commencing upon system start-up and beneficial use, provided such defects are not caused by a misuse, abuse, neglect, unauthorized tampering, equipment modifications, or acts of God. Warranty services shall be provided by the installer of the equipment manufacturer during normal working hours. The representative shall be based in a fully staffed branch office and located within a reasonable distance from the job site. An adequate supply of repair parts shall be maintained by the branch office. The manufacturer shall not be liable for consequential damages. The manufacturer's statement of warranty shall be included in the submittals.

1.11 ADDITIONAL REQUIREMENTS

A. Provide three copies of Record Drawings (As-builts) in addition to the requirements under section 270510. Upon completion (with no more than a month after completion) of the project, the Record Drawings shall be submitted to the Architect/Engineer Technology Designer for approval.

1.12 EXTRA MATERIALS

A. Provide an IEC 61300-3-35 compliant indirect microscope to the Owner to use prior to installing fiber equipment jumpers. Provide one of the following indirect inspection microscopes:
   1. EXFO FIP-435B wireless inspection kit. Provide appropriate software for the owner's IOS or Android Device for test result viewing.
   2. Lightel ViewConn 6200 Plus Package Fiber Optic Video Microscope with CI-1100 Probe
   3. Must include test adapters for SC-UPC, SC-APC, and LC connectors (patch cable and bulkheads)
   4. Provide IEC 61300-3-35 compliant Pass/Fail Software
   5. Provide USB connectivity for Owner Laptop

B. Provide one (1) GP-2224 holster, 2 IBC cleaner tools, and an EXFO FLS-140 VFL visual fault locator.

PART 2 PRODUCTS

2.01 FIBER OPTIC CABLE - SINGLE-MODE (PLENUM-RATED INDOOR/OUTDOOR)

A. The fiber optic cable shall be OS2 single-mode 8.7/125 micron fiber. The cable must be UL listed and shall comply with EIA/TIA-455, ICEA and Bellcore standards. OFNP rated,and tight-buffered. Terminate the single-mode fiber with fusion spliced, factory polished SC-APC connectors to match fiber patch panel module with acceptable fusion spliced Splice-On Connectors (Refer to Fiber Optic Patch Panel article).

B. Cable specifications
   1. Number of strands: as specified
   2. Fiber type: Zero Water Peak - full spectrum
   3. Coating Material: UV acrylate
   4. Attenuation: 0.5 DB/KM at 1310 NM

C. Cable Construction
   1. Strength Member: Aramid yarn
   2. Jacket: Black polyethylene
   3. Plenum rated cable
   4. Fully water-blocked
   5. Provide fabric innerduct in 3" conduit to provide a minimum of three (3) 1" pathways. If installed in underground pathway, provide fabric innerduct with a location conductor option or pull a conductor for location purposes and terminate/label on bonding busbars at each end.

D. Physical Properties
   1. Weight: 21 lbs/1000 ft
   2. Maximum Tension load: 300 lbs
   3. Minimum Bend radius: Per manufacturer recommendations

E. Approved Manufacturers: Refer to Article 2.01

2.02 OUTSIDE PLANT FIBER OPTIC CABLE - SINGLE-MODE (OFNR-RATED INDOOR/OUTDOOR)

A. The fiber optic cable shall be OS2 single-mode 8.7/125 micron fiber. The cable must be UL listed and shall comply with EIA/TIA-455, ICEA and Bellcore standards. OFNR rated,and tight-buffered. Terminate the single-mode fiber with fusion spliced, factory polished SC-APC connectors to match fiber patch panel module with acceptable fusion spliced Splice-On Connectors (Refer to Fiber Optic Patch Panel article).

B. Cable specifications
   1. Number of strands: as specified in T drawings

2. Fiber type: Zero Water Peak - full spectrum
3. Coating Material: UV acrylate
4. Attenuation: 0.5 DB/KM at 1310 NM

C. Cable Construction
1. Strength Member: Aramid yarn
2. Jacket: Black polyethylene
3. OFNR rated cable
4. Fully water-blocked
5. Provide fabric innerduct in 3" conduit to provide a minimum of three (3) 1" pathways. If installed in underground pathway, provide fabric innerduct with a location conductor option or pull a conductor for location purposes and terminate/label on bonding busbars at each end.

2.03 FIBER OPTIC PATCH PANEL SYSTEMS

A. Fiber-optic patch panels
1. Fiber-optic patch panels shall be mounted in equipment racks and Telecommunications Enclosures (TEs).
2. Fiber-optic patch panels shall be rack-mount type and shall be 24/48/72/144 port, or as required to terminate all optical fibers.
3. Provide SC-APC type simplex couplers (green in color) for each single mode fiber cable, Terminate the last six single mode strands of indoor fiber optic cables with SC-APC connectors labeled "Reserved for DAS (far end room number)"
4. Panels shall provide integral splice storage for all ports

B. Fiber-optic connectors
1. Single-mode
a. For each Telecommunication Room cable - Provide SC-APC type simplex couplers (green in color) for each single mode fiber cable and the terminate the last six single mode strands of indoor fiber optic cables with SC-APC connectors labeled "Reserved for DAS (far end room number)"
2. The contractor shall utilize Fusion Splice-On Connectors of the appropriate connector/cable type in lieu of a pigtail/splice tray scheme. Approved connectors:
a. Lynx2 CustomFit® Splice-On Connectors
b. AFL FUSEConnect® Splice-On Connectors
c. Corning FuseLite® Connectors
d. Manufacturers listed in Article 2.01
3. Approved Manufacturers: Refer to Article 2.01

C. Fiber-optic splice trays are not required as splice-on connectors are used.

D. Approved Manufacturers: Refer to Article 2.01

PART 3 EXECUTION

3.01 CABLING TYPES

A. The facility shall incorporate a combination of Single-mode and multi-mode fiber optic cabling.

3.02 TESTING

A. The Contractor shall be responsible for testing each cable "end-to-end" at Architect/Engineer Technology Designer direction and verifying, in writing, that the cabling is in proper working condition. The Contractor is required to test the cable after its installation and to provide Architect/Engineer Technology Designer with written and test equipment generated documentation verifying test results. Each test results shall be labeled as it is in the field with the serving technology room number, patch panel number/letter and patch panel port number.

B. All installation work shall be done in a neat, high quality manner and in conformity with local and federal building codes.

C. Cables shall be placed with sufficient bending radius so as not to kink, shear, or damage outer jacket. Any cables damaged from exceeding bend radius limits shall be replaced.

D. It is the responsibility of the Contractor to calculate all actual cable footage required.

E. Provide cable certification summary report for all test results on 8-1/2 by 11 sheets.

F. Testing Standards:
   1. Where any portion of system does not meet the Specifications, correct deviation and repeat applicable testing at no additional cost to the Owner.
   2. All fiber-optic cables shall be tested with a power meter from each end (ER to TR and TR to ER) and with an OTDR if power meter tests indicate less than optimal readings.
   3. If a fiber backbone cable contains any bad strands, remove and replace entire cable.
   4. Submit printout for each cable tested.
   5. Submit a CD to the Architect/Engineer Technology Designer & Owner with test results and any program required to view results.

3.03 FIELD QUALITY CONTROL

A. Installation personnel shall meet approved manufacturer's training and education requirements for implementation of extended warranty program.

B. Copies of BICSI Technician, Installer and Apprentice certifications and approved cabling systems warranty provider certificates for copper and fiber optic systems shall be available upon request, for primary and/or subcontract personnel.

3.04 CABLE PULLING AND INSTALLATION

A. The equipment racks shall be completely installed before any cables are pulled.

B. Cable rollers shall be used when pulling cable. Cable pulleys must be used when pulling cable around bends and corners of wire ways. Pulleys shall have a minimum diameter of 6 inches.

C. Cable rollers used for pulling in cable shall be mounted close to wire way supports and shall be placed at the beginning of the run and spaced every 25 feet along the run.

D. Contractor shall use basket grips wherever possible and exercise care while pulling cable as not to exceed the maximum allowable pulling strength of the cable. Break away swivels rated at no more than 300 lbs shall be utilized for all fiber pulls (or 10% below the cable's maximum installation tensile rating. Excessive fiber twisting (as determined by jacket labeling having rotated 360 degrees in less than 5 linear feet) shall be considered evidence that a swivel was not used and the entire section must be replaced.

E. Cable pathways outside of the cable tray must be supported by "J" hooks or an approved support for category cabling. "O" rings will not be acceptable. The distance between cabling supports shall not exceed 48".

F. Contractor shall take measures to avoid unsupported bundles of cables hanging over unprotected edges of cable trays etc. during all phases of construction.

G. No cable may be pulled between the holes of the cable tray. Cables must exit over the top of the side rail of the cable tray.

H. Cables are not to be run through conduits or sleeves without bushings installed. Any cabling pulled through conduit or sleeves without bushings must be removed and a new cable pulled.

I. It is not recommended to install cabling in rooms where painting is incomplete. Cabling contractor is responsible to take protective measures to assure cabling is not painted. Any cable found to have paint must be replaced.

J. Cable installed in areas with exposed ceilings must be concealed within conduit. Technology rooms are the only exception.

K. Cable ties and tape are NOT permitted for securing cable coils or supporting cabling in any way during installation, be it temporary or permanent, on any indoor cabling.

L. Cable ties may only be used to secure cabling outdoors. Cable tie ends shall be cleanly cut with flush cutters.

M. Cables shall be bound with non-printed Velcro straps. Plenum rated Velcro must be used above ceiling.

N. No fiber optic cable shall be connected to a patch cable or other device without a prior inspection by an IEC 61300-3-35 compliant indirect microscope.

3.05 LABELING AND MARKING

A. Contractor shall follow the 2023 National Electrical Code and the ANSI/TIA/EIA-606-B Standard for labeling.

B. Contractor shall mark all patch panels, jacks, cables, and cover plates with appropriate permanent printed adhesive labels approved by the Architect/Engineer Technology Designer in accordance with Owner's requirements and Drawings. In addition to adhesive labels, the jacks shall be color coded as directed.

C. Contractor shall install labels as follows:
   1. One label at each end of each cable at the end of the cable sheath, after stripping.
   2. One label at the end of each cable, where it enters the connector in back of the distribution panel, plus one label on the front of the distribution panel, plus one label on the front of the distribution panel centered below each associated cable connector.
   3. All markings shall be carefully done so as to present a neat, professional appearance.

D. Refer to T Drawings for approved patch panel labeling scheme.
   1. Coordinate with CM and Owner so room numbers in labeling scheme match final room numbers.

3.06 CABLE SEPARATION FROM POWER WIRING

A. Between the cabling system and any fluorescent, neon, incandescent, or high intensity discharge lamp fixtures, the minimum distance shall be 6 inches.

B. Cable may be installed closer to lighting and convenience outlet power cable (single phase, 120V, 20A maximum), in metal cable channels for limited distances if the following guidelines are observed:
   1. Coincident (parallel) runs of no more than 15 feet are permissible if a 1 inch separation between the power cable and the cabling system cable is maintained by separators or suitable retention hardware. If necessary, the separation may be less than 1 inch for a run of up to 6 inches if no contact between the cabling system cable and the power cable occur.
   2. Coincident runs of no more than 30 feet are permissible if a 2 inch separation is maintained. The separation may be less than 2 inches for a run of up to 12 inches, if no contact occurs between the cabling system cable and the power cable.

3.07 TRAINING

A. Provide as a part of this contract/bid a total of (8) eight hours of on-site training and demonstration of the new system to the Owner's staff.

B. Demonstrate and explain:
   1. Labeling Scheme
   2. Use of fiber microscope

3. Bonding/Grounding methods

END OF SECTION 27 13 23

SECTION 27 15 13
HORIZONTAL COMMUNICATIONS CABLING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SECTION INCLUDES

A. Horizontal twisted pair copper cable

B. Jacks, cover plates, and associated components

C. Audio/Video cable

1.03 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions and the sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Division 01 for Alternates that may affect the Work of this Section.

C. This Specification covers the following sections from the 2025 OSDM:
   1. 27 1513 - Communications Copper Horizontal Cabling

D. This Specification addresses horizontal cabling required by equipment in the following sections from the 2025 OSDM:
   1. 27 2100 - Data Network Equipment
   2. 27 2133 - Data Communication Wireless Access Points
   3. 27 3150 - Telephone System
   4. 27 4119 - Video Display Equipment
   5. 27 4120 - Interactive Audio-Video Equipment (Classroom Interactive White Boards)
   6. 27 5127 - Classroom Sound Reinforcement System
   7. 28 1601 - Access Control
   8. 27 2300 - CCTV Camera System

1.04 SYSTEM DESCRIPTION

A. The Ethernet System shall be capable of supporting 10/100/1000Mbps full-duplex transmission via 4-pr. Category 6a and Category 6a Shielded cable. The system must comply with EIA/TIA 568-B-5 standard and 568B.1, B.2, B.3 requirements for color-coding.

B. The voice and data cabling system shall consist but not limited to the following:
   1. Category 6a UTP Cabling
   2. Category 6a Shielded Cabling for Wi-Fi Access Points only
   3. Patch Panels
   4. Modular Jacks
   5. Telecommunications Bonding and Grounding System

1.05 DESCRIPTION OF WORK

A. Provide labor, material, equipment, and accessories necessary for operation of a complete network system. The cabling contractor shall furnish the equipment, accessories, and necessary materials as described herein and system Drawings.
   1. There are one (1) Telecommunications Rooms

a. Telecommunications Room A115
    1) Provide wiring system in unit per Drawings, Schedules, and this Specification.

B. The Technology work for cabling shall include, but not limited to, the following:
    1. Provide all horizontal UTP, shielded cabling, and audio-visual cable.
    2. Provide copper patch panels.
    3. Provide modular jacks and cover plates for system.
    4. Provide and terminate cabling within each room and in the data racks.

C. The modular computer/data eight-position jack shall match the color code EIA-568B as follows:
    1. Pair 1: Pin 4 - Blue; Pin 5 - White/Blue
    2. Pair 2: Pin 1 - White/Orange; Pin 2 - Orange
    3. Pair 3: Pin 3 - White/Green; Pin 6 - Green
    4. Pair 4: Pin 7 - White/Brown; Pin 8 - Brown

1.06 QUALITY ASSURANCE

A. All cabling components and equipment shall be listed by Underwriters Laboratories, Inc. for network use, and the components shall bear the UL label. The system shall be installed in accordance with requirements set by the 2023 National Electrical Code.

B. Installing contractor must have a minimum of 5 years experience in computer network cable installations and utilize data cable installation technicians.

C. The contractor shall employ on his staff at least one Registered Communications Distribution Designer (RCDD) registered with the Building Industries Consulting Services International (BICSI) or be certified by the manufacturer of the cable solution for both copper and fiber systems.

D. The contractor shall submit with his bid the name, registration number, and seal of the RCDD on the contractor's staff or provide certificates from manufacturer of the cable solution for both copper and fiber systems.

E. The RCDD or factory trained designer shall review all design documents including these bid Specifications and provide in writing with the contractors bid, certification of this review, and shall note any and all discrepancies that the RCDD believes are of material concern to the completion of a fully operating system.

F. The RCDD or factory trained designer shall certify the final installation in writing and provide written verification that he/she has inspected the completed installation and that the installation meets the terms and conditions of this Specification, design requirements of the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual), and all EIA/TIA, NFPA, NEC, and all local codes and Specifications related to this work.

G. All design documents, submittals, as-built Drawings, test results, and other documentation provided by the contractor shall bear the name, registration number, and seal of the RCDD responsible for this bid.

1.07 CERTIFICATION

A. The cabling contractor shall provide the services of a network cabling company and provide equipment listed by Underwriters Laboratories, Inc. The cabling contractor shall issue an equipment certification stating that the equipment and connected wiring and devices which form the specified system, together with installation have a 20-year Application Assurance Product Warranty for a Gigabit (Standard) and/or 10 Gigabit Ethernet Solution, and are in compliance with the requirements established by EIA/TIA 568, B.1, B.2, B.3, 569, and BICSI Standards.
    1. Category 6a Channel & Component Warranty - 10 Gigabit
    2. Shielded Category 6a Channel & Component Warranty - 10 Gigabit

1.08 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section. **No cabling shall be installed prior to this meeting.**
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Fort Loramie Local School District Board of Education - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.09 SUBMITTALS

A. Prior to commencement of work.
   1. Shop Drawings -Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
      a. The contractor shall be responsible for furnishing engineering Drawings which indicate the interlocking of equipment and wiring external to the various patch panels. These Drawings shall be included in the submittal to the Architect/Engineer Technology Designer for approval.
      b. Complete and comprehensive shop Drawings shall be submitted to the Architect/Engineer Technology Designer for review.
      c. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.
      d. The contractor shall submit a schematic of the proposed bonding and grounding system outlining connectivity, landing locations of conductors on busbars, and components to be provided. Catalog cut sheets are required for busbars, bonding & grounding conductors, and all connectors (6 AWG & above) used in the bonding system to the Architect/Engineer Technology Designer for review.
   2. Provide documentation of on-staff RCDD or verifiable manufacturer certification and conformance with all of Article 1.06 Quality Assurance.
   3. Provide sample of weekly inspection log to be placed on the wall of each telecommunications space. Log to include inspection date, room condition, name of inspector, and action taken.

B. Post Construction
   1. Contractor to submit training syllabus to the Architect/Engineer Technology Designer for approval at least two weeks prior to commencement of training sessions.
   2. Provide a complete wiring diagram of the system. Typicals, and the like, will not be acceptable. Include 1/8 inch = 1'-0" scale Drawings of the system layout. These diagrams shall conform to Article 1.06 Quality Assurance.
   3. Include three (3) printed copies of all test data for the cabling system. Also, provide two (2) CD ROMs/digital copies containing the test data with any utility programs that may be necessary to view the data.
   4. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect's technology designer.
   5. Operation & Maintenance Manuals
      a. Provide complete O & Ms. One hard copy and PDF format.
      b. Both formats shall be fully indexed with tabs by Section Name/System/Device.

6. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.10 WARRANTY

A. Components, parts, and assemblies supplied by the cabling contractor/manufacturer shall be guaranteed against defects in materials and workmanship for a period of 15 years, commencing upon system start-up and beneficial use, provided such defects are not caused by a misuse, abuse, neglect, unauthorized tampering, equipment modifications, or acts of God. Warranty services shall be provided by the installer of the equipment manufacturer during normal working hours. The representative shall be based in a fully staffed branch office and located within a reasonable distance from the job site. An adequate supply of repair parts shall be maintained by the branch office. The manufacturer shall not be liable for consequential damages. The manufacturer's statement of warranty shall be included in the submittals.
   1. Category 6a Channel & Component Warranty - 10 Gigabit
   2. Shielded Category 6a Channel & Component Warranty - 10 Gigabit

1.11 ADDITIONAL REQUIREMENTS

A. Provide three copies of Record Drawings (As-builts) in addition to the requirements under section 270510. Upon completion (with no more than a month after completion) of the project, the Record Drawings shall be submitted to the Architect/Engineer Technology Designer for approval.

1.12 EXTRA MATERIALS

A. Maintenance Stock
   1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      a. Patch-Panel Units: The greater of one (1) or 10% of total quantity of each type.
      b. Connecting Blocks: The greater of one (1) or 10% of total quantity of each type.
      c. Device Plates: The greatest of ten (10) or 2% of total quantity of each type.
   2. Provide one (1) Metro DataVac (model MDV-3TCA) or equal in each Telecommunications Room for the purposes of maintaining Telecommunications room cleanliness through the construction period by technology contractors and by the Owner thereafter.

B. Obtain Owner's signature acknowledging receipt of extra stock.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The installation shall be an end to end solution utilizing the following approved manufacturers:
   1. Category 6a Cabling:
      a. ADC AMP/Tyco - TrueNet series Components
      b. Commscope - SYSTIMAX GigaSPEED X10D
      c. Panduit - MiniCom, and TX6A Series Components
      d. Leviton/Remee - NetSync™ 10G
      e. Hubbell - NEXTSPEED Ascent series components
      f. Hubbell - Hitachi
      g. Superior Essex - Superior Essex 10Gain
      h. Pangen -(includes General Cable) - PanGen 6A
      i. Berk-Tek/Leviton - LANmark 10G
   2. Category 6a Shielded Cabling:
      a. ADC AMP/Tyco - AMP NETCONNECT XGa system
      b. Commscope - GigaSPEED X10DShielded system

c. Panduit - MiniCom, and TX6A Series Shielded Components
d. Leviton/Remee - XGO cabling/ Quickport series components
e. Hubbell - Ascent series Shielded Category 6a components
f. Superior Essex - Superior Essex CAT6A ScTP
g. Pangen -(includes General Cable) - PanGen with GenSpeed 6500 series cable
h. Berk-Tek/Leviton - LANmark- 10G FTP Plenum Category 6A, F/ UTP

3. Note: Other combinations of approved termination and cabling manufacturers may be submitted provided all specifications, warranties, and drawing requirements are met

2.02 DATA CABLE

A. Approved Manufacturers: Refer to Article 2.01

B. Category 6a Cable
1. The computer/data cable shall be four twisted pair unshielded (UTP), 23 AWG, solid bare CU, FEP insulation for all 4 pairs to reduce skew (skew shall be less than 18 nsec). UL listed CMP with transmission characteristics that meet and exceed those of FCC-68/EIA/TIA, 568 and EIA/TIA TSB-155 performance to 100 meters and NEMA low loss, extended frequency, jacket shall be sequentially marked at 2 foot intervals and must be plenum rated. UL listed 1459 and 1863. Pairs twisting must be maintained to meet the category 6a performance. Maximum category 6a untwisting allowed is one half (1/2) inches, cable diameter .32 inches or less.

C. Category 6a Shielded Cable
1. The computer/data cable shall be four twisted pair, shielded F/UTP , 23 AWG, solid bare CU, FEP insulation for all 4 pairs to reduce skew (skew shall be less than 18 nsec). UL listed CMP with transmission characteristics that meet and exceed those of FCC-68/EIA/TIA, 568 and EIA/TIA TSB-155 performance to 100 meters and NEMA low loss, extended frequency, jacket shall be sequentially marked at 2 foot intervals and must be plenum rated. UL listed 1459 and 1863. Pairs twisting must be maintained to meet the category 6a performance. Maximum category 6a untwisting allowed is one half (1/2) inches, cable diameter .32 inches or less.

D. All cable shall be plenum rated UNO.

E. For cable runs terminating in first floor floor boxes, provide wet location certified cabling from floor box to the nearest ceiling mounted consolidation point. Transition from wet location cabling to conventional plenum cabling from the consolidation point to the serving technology room.

F. Cable shall be component certified.

G. Cable jacket color shall be:
1. Data Network serving data outlets - Blue
2. IP Telephone Network serving telephone outlets - Yellow
3. Wi-Fi Network serving Wi-Fi Access points - Blue
4. IP Camera/Security serving IP cameras/Security/Access Control - Green
5. Local A/V cabling (in-room) - Orange

H. Standards:
1. Category 6a - Design bandwidth - 500 MHz cable bandwidth, standard data rate 10 Gbps capable.
2. Shielded Category 6a - Design bandwidth - 500 MHz cable bandwidth, standard data rate 10 Gbps capable.

I. Color Code
1. Pair #1 - White/Blue and Blue

2. Pair #2 - White/Orange and Orange
3. Pair #3 - White/Green and Green
4. Pair #4 - White/Brown and Brown

J. Testing Standard:
1. Category 6a - Cable to be tested using a Level-IIIe Cable Certification Unit.
2. Shielded Category 6a - Cable to be tested using a Level-IIIe Cable Certification Unit

2.03 COPPER PATCH PANELS

A. Provide 48 and/or 24 port 8P8C modular patch panels as required for termination of all UTP cables with front and back cable management.

B. Standards:
1. Category 6a - Patch panels must meet or exceed all transmission performance for Category 6a as outlined in EIA/TIA-568 C.2, and be component certified.
2. Shielded Category 6a - Patch panels must meet or exceed all transmission performance for Category 6a as outlined in EIA/TIA-568 C.2 and be component certified.

C. Each 8P8C jacks will be terminated with 4 pair of UTP wire and shall be wired to meet EIA/TIA 568B (color code).

D. Provide a rear-mounted strain relief bar on each patch panel.

E. For shielded patch patch panels - Patch Panel must be bonded to TMGB or TGB via direct connection or rack bonding mechanism (provided that rack is bonded with a 6 AWG conductor to the TMGB or TGB) with the maximum size conductor supported by the panel (6 AWG maximum, 12 AWG minimum)

F. For multi-pair copper backbone terminations provide a 110 style, Cat 5e rated, backboard mounted 110 cross connect field.

G. Approved Manufacturers: Refer to Article 2.01

2.04 DATA JACKS

A. Provide a flush mounted, modular data jack 8P8C to fit in a two gang 3-1/2 inch deep box or floor box as shown on the Drawings and as specified herein.

B. Data jacks shall be 8-position configurations and shall meet all the transmission performance of cabling standards required.

C. Standards:
1. Category 6a - The data jacks must be UL listed and must meet EIA/TIA 568 C.2, TSB-155 Category 6a channel requirements and be component certified.
2. Shielded Category 6a - The data jacks must be UL listed and must meet EIA/TIA 568 C.2, TSB-155 Category 6a channel requirements and be component certified.

D. The data jacks to be wired to EIA/TIA 568B (color code).

E. All terminations shall also terminate cable shields when shielded cabling is utilized.

F. Modular data jacks shall be mounted in modular wall plates for below ceiling jacks and one/two port surface mount boxes for above ceiling jacks.

G. Individual jack colors shall be:
1. Data Network - Data outlets - Blue
2. IP Telephone Network Telephone outlets - Yellow
3. Wi-Fi Network outlets Wi-Fi Access points - Blue
4. IP Camera/Security serving IP cameras/Security - Green
5. Local A/V cabling (in-room) - Orange
6. Colored flag tags matching the scheme above shall be used for Field Terminable Plugs

H. Approved Manufacturers: Refer to Article 2.01

2.05 MODULAR WALL PLATES

A. Provide modular cover plates with number of modular data jack/telephone jacks as shown on the Drawings and as specified in this section.

B. Match color of Electrical cover plates.

C. Approved Manufacturers: Refer to Article 2.01

2.06 HORIZONTAL WIRE MANAGEMENT

A. Provide horizontal wire management in racks as indicated on the Drawings.

B. Horizontal cable manager shall be front & rear, 2RU per Drawings. 19 in. rack system width.

C. Approved Manufacturers: Same manufacturer as racks provided by section 27 1100 contractor.

2.07 EQUIPMENT RACKS - PROVIDED BY 27 1100 COMMUNICATION EQUIPMENT ROOM FITTINGS

2.08 CONSOLIDATION POINTS

A. Above Ceiling Mount - plenum rated
   1. Provide where indicated on Drawings
   2. Use as intermediate cable transition from underfloor wet location rated cabling (any first floor, floor boxes) to appropriate plenum rated cabling.
   3. Provide one 100 pair category 6 110 block per consolidation point.
   4. Provide all mounting materials to install per manufacturer recommendations.
   5. Mount to wall above ceiling where noted on Drawings.
   6. Manufacturers
      a. Chatsworth - Basic Consolidation Enclosure BCE-24-P (requires adapter from 2U 19" form factor to 110 block mount)
      b. Panduit - WMCPE enclosure with appropriate base to accommodate required 110 block.
      c. LeGrand - CZE-242412PP
   7. Label Consolidation Points per the ANSI/TIA 606-B labeling standards.

2.09 VIDEO CABLE

A. HDMI – Type A connector – High Speed HDMI with Ethernet and support for HDMI 2.0b

B. For HDMI connections longer than 25 feet, an active optical HDMI cable must be used.

C. All HDMI cabling provided by this project must support 4K video @ 60Hz 4:4:4 HDMI 2.0 HDCP 2.2 with an 18.2 Gb/s data rate.

D. All open cable above ceiling must be plenum rated.

E. Approved Manufacturers: Refer to Article 2.01.

2.10 ITC (INFORMATION TECHNOLOGY CENTERS) SITE DEMARC

A. The cabling contractor must be temporarily listed with the telecommunications service provider used by the Owner for ITC wide area network services and shall coordinate installation of wide area network entrance facilities onto the demark board per Technology Room Elevations in Main Equipment Room EXISTING.

2.11 AUDIO CABLE

A. Stereo audio cables - 22 gauge, tinned copper, 4 conductor cable with 100% overall shield, black jacket.

B. All open cable above ceiling must be plenum rated.

C. Approved Manufacturers: Extron, Belden, CommScope, WestPenn, Superior Essex.

PART 3 EXECUTION

3.01 CABLING TYPES

A. The facility shall incorporate a combination of shielded twisted pair (F/UTP) and unshielded twisted pair (UTP).

3.02 TWISTED PAIR CABLE (UTP & F/UTP)

A. The computer eight-position modular jack wiring Pin/Pair assignment shall match the EIA-568B as follows:
   1. Pair 1: Pin 4, Blue; Pin 5, White/Blue
   2. Pair 2: Pin 1, White/Orange; Pin 2, Orange
   3. Pair 3: Pin 3, White/Green; Pin 6, Green
   4. Pair 4: Pin 7, White/Brown; Pin 8, Brown

B. Termination of the Category 5e 6 and Category 6a F/UTP cabling shall consist of the following:
   1. The data outlet shall consist of 8P8C modular jacks. Each 8P8C jack will be terminated with 4 pairs of F/UTP wire as indicated above.
   2. Provide 24 and/or 48 port 8P8C patch panels as required by Drawings. Each 8P8C jack will be terminated with 4 pairs of UTP wire.
   3. Provide wire management in rack as indicated on the Drawings.
   4. For shielded cables bond shield drain wire at patch panel end and patch panels to the existing rack busbar.

C. Maximum pulling force is 25 lbs or as recommended by the manufacturer.

3.03 TESTING

A. The Contractor shall be responsible for testing each cable "end-to-end" at Architect/Engineer Technology Designer direction and verifying, in writing, that the cabling is in proper working condition. The Contractor is required to test the cable after its installation and to provide Architect/Engineer Technology Designer with written and test equipment generated documentation verifying test results. Each test results shall be labeled as it is in the field with the serving technology room number, patch panel number/letter and patch panel port number. The field test shall be for Category 5e (Standard), Category 6, or Category 6a standards/requirements.
   1. Category 6a - must meet ANSI/TIA/EIA-568-B.2-10, TSB-155 Category 6a channel requirements and be component certified.
   2. Shielded Category 6a - must meet ANSI/TIA/EIA-568-B.2-10, TSB-155 Category 6a channel requirements and be component certified.

B. All installation work shall be done in a neat, high quality manner and in conformity with local and federal building codes.

C. Cables shall be placed with sufficient bending radius so as not to kink, shear, or damage outer jacket. Any cables damaged from exceeding bend radius limits shall be replaced.

D. It is the responsibility of the Contractor to calculate all actual cable footage required.

E. Provide cable certification summary report for all test results on 8-1/2 by 11 sheets.

F. It is the responsibility or the contractor to verify the labeling at the faceplate while testing to ensure ALL work area outlets are labeled correctly. If it is found that more than 5% of the cables are incorrectly labeled the contractor will be required to retest ALL cabling and correct labeling.

G. Basic Link Testing

1. Category 6a - UTP - Testing of all installed "Basic Links" shall be performed using a Level IIIe hand-held tester with latest software version and performed to the latest revision of TIA/EIA TSB-67, TIA/EIA TSB-155 to 100 meters, and ANSI/TIA/EIA-568-B.10.2. All reports shall be recorded and presented to the Owner before acceptance.
2. Shielded Category 6a - Testing of all installed "Basic Links" shall be performed using a Level IIIe hand-held tester with latest software version and performed to the latest revision of TIA/EIA TSB-67, TIA/EIA TSB-155 to 100 meters, and ANSI/TIA/EIA-568-B.10.2. All reports shall be recorded and presented to the Owner before acceptance.

H. Testing Standards:
1. Category 6a - Testing of cabling shall be performed prior to system cut-over, 100 percent of the UTP & horizontal and copper backbone pairs shall be tested for opens, shorts, polarity reversals, transposition and presence of AC voltage. UTP voice and data horizontal wiring pairs shall be tested to TIA/EIA 568B Addendums 1, 2, 5, 10 and TSB-67, and TIA/EIA-568B.2-10 from the information outlet to the TC and from the TC to the information outlet. In addition, all assigned circuits shall be tested from the information outlet/building control device to the MDF. Correct grounded and reversed pairs. Examine open and shorted pairs to determine if problem is caused by improper termination. If termination is proper, tag bad pairs at both ends and note on termination sheets.
2. Shielded Category 6a - Testing of cabling shall be performed prior to system cut-over, 100 percent of the UTP & horizontal and copper backbone pairs shall be tested for opens, shorts, polarity reversals, transposition and presence of AC voltage. UTP voice and data horizontal wiring pairs shall be tested to TIA/EIA 568B Addendums 1, 2, 5, 10 and TSB-67, and TIA/EIA-568B.2-10 from the information outlet to the TC and from the TC to the information outlet. In addition, all assigned circuits shall be tested from the information outlet/building control device to the MDF. Correct grounded and reversed pairs. Examine open and shorted pairs to determine if problem is caused by improper termination. If termination is proper, tag bad pairs at both ends and note on termination sheets.
3. For all cables terminated with Field Terminable Plugs, a TIA-568-C.2, Clause C.5.2 compliant Patch Cord Test Adapter shall be utilized.
4. All reports shall be recorded and presented to the Architect/Engineer Technology Designer and Owner before acceptance.
5. If horizontal cable contains bad conductors, remove and replace cable.
6. Submit printout for each cable tested.
7. Submit a CD with test results and any program required to view results.

I. Where any portion of system does not meet the Specifications, correct deviation and repeat applicable testing at no additional cost to the Owner.

3.04 FIELD QUALITY CONTROL

A. Employ Job superintendent or project manager during the course of the installation to provide coordination of work of this Specification, of other trades, and provide technical information when requested by other trades.
1. This person shall be responsible for quality control during installation, equipment set-up, and testing.
2. This person shall attend both the technology kick-off meeting and subsequent progress meetings.

B. Installation personnel shall meet approved manufacturer's training and education requirements for implementation of extended warranty program.

C. Copies of BICSI Technician, Installer and Apprentice certifications and approved cabling systems warranty provider certificates for copper and fiber optic systems shall be available upon request, for primary and/or subcontract personnel.

D. Provide an Inspection of all tech rooms weekly and vacuum if needed once any permanent cabling termination is made.

E. Maintain weekly inspection log on the wall of each telecommunications space. Log to include inspection date, room condition, name of inspector, and action taken. Provide Log sample with product submittals.

3.05 CABLE PULLING AND INSTALLATION

A. The equipment racks shall be completely installed before any cables are pulled.

B. Cable rollers shall be used when pulling cable. Cable pulleys must be used when pulling cable around bends and corners of wire ways. Pulleys shall have a minimum diameter of 6 inches.

C. Cable rollers used for pulling in cable shall be mounted close to wire way supports and shall be placed at the beginning of the run and spaced every 25 feet along the run.

D. Contractor shall use basket grips wherever possible and exercise care while pulling cable as not to exceed the maximum allowable pulling strength of the cable. Break away swivels rated at no more than 300 lbs shall be utilized for all fiber pulls (or 10% below the cable's maximum installation tensile rating. Excessive fiber twisting (as determined by jacket labeling having rotated 360 degrees in less than 5 linear feet) shall be considered evidence that a swivel was not used and the entire section **must** be replaced.

E. Cable pathways outside of the cable tray must be supported by "J" hooks or an approved support for category cabling. "O" rings will not be acceptable. The distance between cabling supports shall not exceed 48".

F. Category cables, security/access control, and paging cables shall be separated from one another in the wire mesh cable tray at a minimum of 6" or by a physical barrier of the same manufacture as the cable tray.

G. Contractor shall economize on the use of cable by limiting excess length on runs to 6 inches at the jack/outlet (2'6" above ceiling) and 3 feet at the distribution panels (9 feet above rack).

H. Contractor shall take measures to avoid unsupported bundles of cables hanging over unprotected edges of cable trays etc. during all phases of construction.

I. No cable may be pulled between the holes of the wire mesh cable tray. Cables must exit over the top of the side rail of the cable tray.

J. Cables are not to be run through conduits or sleeves without bushings installed. Any cabling pulled through conduit or sleeves without bushings **must** be removed and a new cable pulled.

K. It is not recommended to install cabling in rooms where painting is incomplete. Cabling contractor is responsible to take protective measures to assure cabling is not painted. Any cable found to have paint **must** be replaced.

L. Cable installed in areas with exposed ceilings **must** be concealed within conduit. Technology rooms are the only exception.

M. Cable ties and tape are **NOT** permitted for securing cable coils or supporting cabling in any way during installation, be it temporary or permanent, on any indoor cabling.

N. Cable ties may only be used to secure cabling outdoors. Cable tie ends shall be cleanly cut with flush cutters.

O. Cables shall be bound with non-printed Velcro straps. Plenum rated Velcro must be used above ceiling.

3.06 LABELING AND MARKING

A. Contractor shall follow the 2023 National Electrical Code and the ANSI/TIA/EIA-606-B Standard for labeling.

B. Contractor shall mark all patch panels, jacks, cables, and cover plates with appropriate permanent printed adhesive labels approved by the Architect/Engineer Technology Designer in accordance with Owner's requirements and Drawings. In addition to adhesive labels, the jacks shall be color coded as directed.

C. Contractor shall install labels as follows:
   1. One label at each end of each cable at the end of the cable sheath, after stripping.
   2. One label on the inside of each outlet box (vacant), plus one label on the outside of each face plate in the space provided.
   3. One label at the end of each cable, where it enters the connector in back of the distribution panel, plus one label on the front of the distribution panel, plus one label on the front of the distribution panel centered below each associated cable connector.
   4. All markings shall be carefully done so as to present a neat, professional appearance.

D. Provide means to identify locations of above ceiling outlets (Wi-Fi and IP CCTV camera) from below the ceiling.

E. Refer to T Drawings for approved outlet & patch panel labeling scheme.
   1. Coordinate with CM and Owner so room numbers in labeling scheme match final room numbers.

F. It is the responsibility or the contractor to verify the labeling at the faceplate while testing to ensure ALL work area outlets are labeled correctly. If it is found that more than 5% of the cables are incorrectly labeled the contractor will be required to retest ALL cabling and correct labeling.

3.07 CABLE SEPARATION FROM POWER WIRING

A. Between the cabling system and any fluorescent, neon, incandescent, or high intensity discharge lamp fixtures, the minimum distance shall be 6 inches.

B. Cable may be installed closer to lighting and convenience outlet power cable (single phase, 120V, 20A maximum), in metal cable channels for limited distances if the following guidelines are observed:
   1. Coincident (parallel) runs of no more than 15 feet are permissible if a 1 inch separation between the power cable and the cabling system cable is maintained by separators or suitable retention hardware. If necessary, the separation may be less than 1 inch for a run of up to 6 inches if no contact between the cabling system cable and the power cable occur.
   2. Coincident runs of no more than 30 feet are permissible if a 2 inch separation is maintained. The separation may be less than 2 inches for a run of up to 12 inches, if no contact occurs between the cabling system cable and the power cable.

3.08 TRAINING

A. Provide as a part of this contract/bid a total of (10) ten hours of on-site training and demonstration of the new system to the Owner's staff.

B. Demonstrate and explain:
   1. Labeling Scheme
   2. Use of Data Vac
   3. Bonding/Grounding methods for shielded horizontal cabling
   4. Fundamentals of Structured Cabling (patch cable routing, patch cable selection, rules to maintain channel warranty, etc)

END OF SECTION 27 15 13

SECTION 27 21 00
DATA NETWORK EQUIPMENT

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SECTION INCLUDES

A. Network Switches
   1. 24/48 port PoE switches

B. Patch cables

C. Network core switch

D. Uninterruptible power supplies (UPS's)

1.03 SYSTEM DESCRIPTION

A. The Local Area Network (LAN) Electronics shall be a fully switched 10/100/1000 Ethernet Network System. The individual edge switch size shall be 24 or 48 ports. Individual switches shall be connected into a switch stack. Each switch stack will be equipped with two (2) full duplex fiber 10Gbase uplinks to the main core switch located in the Main Equipment Room.

B. The network core switch at each school shall consist of a minimum of a 256 Gigabit switching capacity, layer-3 core switch for termination of the fiber 10Gbase links from the individual switch stacks, and GigE links for WAN links and file servers. The network core switch shall be equipped with dual power supplies.

C. There are a total of one (1) Telecommunications Rooms.
   1. Telecommunications Room 1 - A115

1.04 DESCRIPTION OF WORK

A. Provide labor, material, equipment and accessories necessary for a complete operable network system. The contractor shall furnish the equipment, accessories and necessary material as described herein.

B. The contractor shall include programming and complete testing of the Ethernet network system (with all devices connected to it, as computers, printers, etc.). Network configuration of the Ethernet network system shall be per Owners requirements.

C. The new equipment shall consist of the following: Ethernet switches, network management software, and associated material, and hardware necessary for a complete, satisfactorily installed operating system which meets specified requirements.

D. The computer/network eight-position modular jack wiring Pin/Pair assignment shall match the EIA-T568B as follows:
   Pair 1: Pin 4, Blue; Pin 5, White/Blue
   Pair 2: Pin 1, White/Orange; Pin 2, Orange
   Pair 3: Pin 3, White/Green; Pin 6, Green
   Pair 4: Pin 7, White/Brown; Pin 8, Brown

E. In each Telecommunications Room, the fiber optic 50/125 multimode and single mode cabling is terminated with “SC-UPC” ceramic tip type connectors. Multimode connectors shall be aqua in color, single mode connectors shall be blue in color.

F. Provide as part of this contract on-site training, teaching and demonstration of the system to a number of people as indicated and selected by the school.

1.05 QUALITY ASSURANCE

A. All computer equipment and peripheral shall be listed by Underwriters Laboratories, Inc. and shall bear the UL label. The system shall be installed in accordance with requirements set by National Electrical Code, and shall comply with FCC rules for its own application.

B. All equipment and Installation Practices shall comply with the latest ANSI/NFPA-70 National Electrical Code.

C. All equipment installation practices shall comply with the local electric code.

D. All equipment shall comply with the latest ANSI-J-STD-607-C Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications Standard.

E. All equipment and Installation Practices shall comply with the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual).

F. All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607, and 862 standards.

1.06 CERTIFICATION

A. Contractor shall provide the services of a computer network company and shall be 100 percent certified by the manufacturer. The computer network system contractor shall perform all work in compliance with the requirements established by EIA/TIA 568, 569, IEEE 802.3, and BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual) standards.

1.07 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Fort Loramie Local School District Board of Education - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.08 SUBMITTALS

A. Pre-Construction
   1. Shop Drawings - Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
      a. Provide catalog cuts of products for review in the format required by the project front-end Specifications. All products provided must be clearly identified in submittal documents. NOTE: If submittals do not contain complete information causing the Architect/Engineer Technology Designer to perform more than two (2) reviews with respect to any section submittal, the Contractor shall be liable for costs to the Owner resulting from the additional Architect/Engineer Technology Designer submittal reviews. The Owner may withhold from sums due or coming due the Contractor to cover such costs and expenses.
      b. Provide schematic Drawings indicating the network configuration for review and approval before starting the final programming and connections of the system.
      c. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.

B. Post Construction
   1. Provide list of all devices provided complete with location (building, room number, rack number & rack position), model numbers, serial numbers, and administrative passwords in both hard copy and electronic spreadsheet (MS Excel compatible) to the Owner and Architect/Engineer Technology Designer.
   2. Provide signed (by attendees & trainer)& dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
   3. Operation & Maintenance Manuals
      a. Provide complete O & Ms. One hard copy and PDF format.
      b. Both formats shall be fully indexed with tabs by Section Name/System/Device.
   4. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.09 WARRANTY

A. The data network equipment and all associated software shall be warranted by the contractor for a period of three (3) years from date of project completion. Provide advanced replacement for all Data Network Equipment and business hours standard technical support, 7 X 24 emergency technical support and software support (including revisions, fixes and upgrades) for the three (3) year period.

B. All repair and replacement parts shall be new from the manufacturer during the warranty period.

1.10 EXTRA MATERIALS

A. Maintenance Stock
   1. Provide patch cables for connecting end user devices to permanent links, including owner equipment.
   2. Provide factory certified 10% spare patch cables for extra stock. Vary the lengths equally of 7 foot and 15 foot.
   3. Provide 15 KVM cables per File Server Article.

B. Obtain Owner's signature acknowledging receipt of extra stock.

PART 2 PRODUCTS

2.01 POWER OVER ETHERNET (POE) SWITCHES

A. Provide powered manageable Ethernet network rack mounted switches where indicated on the Drawings.

B. Switches shall be rated 10/100/1000 Base-T Ethernet/Fast Ethernet, Layer 2 manageable switch.

C. Switches shall comply with IEEE 802.3.at-2009, ISO 8802/3.

D. Switches must provide 802.3.at Type 2 (PoE+) power on all ports simultaneously. Standard 30 watts per port.

E. Provide additional internal or external power supplies and appropriate length power cables to connect switch to provide required power per port. Manufacturer to be the same as switch manufacturer.

F. Switches shall be 24 Port
   1. If use of uplink ports detracts from usable ports, provide additional ports equal to the number of uplinks ports in each tech room.

G. Stacking capability is a requirement. Each stack will be connected to the core with two (2) 10Gbase fiber uplinks per stack. Provide stacking modules and stacking cables necessary to complete fully redundant stacks. A maximum of 8 switches may be in one stack.

H. Switches to be full duplex to core switch.

I. Switches shall support IGMP snooping v1, v2 and v3.

J. Provide patch cables (channel approved or component certified) needed from patch panel to switch per Drawings to activate ports. Patch cables must match category of channel which will be:
   1. Category 6a

K. The switches shall be "non-blocking" and support a minimum forwarding bandwidth equal to the number of switch ports x 1 Gbps.

L. Provide support for IP v6 addressing.

M. The network switches shall support advanced services including:
   1. Building Management Systems
   2. IP Telephony
   3. Video Streaming
   4. Wireless Networking

N. Approved Manufacturers:
   1. Basis of Design - Cisco 9200

O. Provide unit pricing.

P. Uninterruptible power supply (UPS)
   1. Provide dual conversion UPS units for each Telecommunications Room electronics and for the file server, provide sufficient protection from power anomalies.
   2. Provide any adapters for existing rack mounted power strips and connected to the UPS units. Locate the power strips in the equipment racks and on the equipment backboards powering all electronics systems in each Telecommunications Room.
   3. Provide shutdown connections from the UPS to servers for graceful power down in the event of a power failure.
   4. Equip the UPS units with a twist-lock power cable and SNMP management card.
   5. Connect each UPS SNMP management to the management VLAN.
   6. UPS equipment sizing must be calculated by each bidder for the equipment bid.
   7. UPS equipment to be rack mountable.
   8. Coordinate with electrical contractor to install UPS AC outlets.
   9. Uninterruptible Power Supply (UPS)
      a. Connected to building emergency generator system
      b. Provide UPS backup of all switches in each Telecommunications Room. Each Telecommunications Room rack to have a 3000VA UPS.
   10. Managed power strip- provide two - power strip 27 NEMA 5-15/20 (T-slot) outlets; 30A/120VAC/10' cord/ locking NEMA input plug - 1 for server rack and 1 for switch rack.
      a. Approved Manufacturers:
         1) Vertiv VP8932
         2) Tripp Lite PDUMV30NETLX
         3) APC AP8932
   11. Power servers, wireless management server, bulletin board server, security server, IP KVM w/ single LCD monitor, and PoE telephony switches from this unit. All other switches/devices to be powered from generator protected power strips. The IP telephony server and associated components will have a separate UPS supplied by the telephone system contractor.
   12. Telecommunications Rooms
      a. Provide one (1) UPS per rack, 3000VA, RM-2U 120V online, 1- L5-30R out and 4 out 5 -20R, RM/Tower

1) Approved Manufacturers:
(a) Vertiv-Liebert GXT5-3000RT120
(b) Tripp Lite SMART3000RM2U
(c) Eaton 9PX3000RT

b. Provide one (1) rack mounting kit per UPS.
c. Provide one - 10/100 Mbit Ethernet SNMP Kit.
1) Approved Management card manufacturers:
(a) Vertiv-Liebert GXT4-3000RT120
(b) Tripp Lite SMART3000RM2U
(c) Eaton 9PX3000RT

d. Power PoE telephony switches and up to 4 standard 24 port switches with this unit. All other switches/devices to be powered by generator protected outlet strips.

13. Provide one (1) environmental monitoring unit for one UPS in each Telecommunications Room to measure room temperature. Provide automated exception (over temperature) reporting through management software

Q. Patch Cables
1. Patch Cable Jacket Colors
a. Standard data patch cables shall have a blue jacket.
b. Voice over IP patch cables shall have a yellow jacket.
c. IP Security/Camera patch cables shall have a green jacket.
d. Wireless network patch cables shall have a blue jacket.

PART 3 EXECUTION

3.01 INSTALLATION

A. The contractor's commencement of equipment installation indicates acceptance of the telecommunications infrastructure and conditions.

B. Install file server and setup basic user accounts and network configuration.

C. No fiber optic cable shall be connected to a patch cable or other device without a prior inspection by an IEC 61300-3-35 compliant indirect microscope and obtain a passing test result.

D. Install data network Ethernet switches and validate connectivity throughout. Establish all VLAN's, QoS, IP routing and IP subnets.

E. Provide the following VLAN's and QoS:
1. Administration (802.1p level 3)
2. HVAC (802.1p level 4)
3. Network Management (802.1p level 7)
4. Point of Sale (802.1p level 3)
5. Student (802.1p level 0)
6. Video (802.1p level 4)
7. Voice (802.1p level 6)
8. Wireless - Configure EAP authentication for wireless network with existing school authentication platform. Coordinate with Owner. (802.1p level 0)
9. CCTV (802.1p level 5)
10. Note: Submit copy of list of configured VLANs to Architect/Engineer Technology Designer and the School Technology Coordinator derived from the configuration file of each core switch. For PoE switches, no mixing of IP Voice, Wireless, or IP Camera/security is permitted within the same 24 port switch.

F. Coordinate network installation and integration with other systems connected to the network with District's and applicable ITC-Site's technical and operational requirements.

G. System time shall be synchronized from the District's designated network time protocol server(s).

H. Coordinate with and support the A/V contractor to set up switching network to distribute the owner's IP video headend.

I. Install and setup UPS units and establish power down procedures.

J. Connect system to ITC-Site WAN links and configure as per ITC-Site requirements.

K. Program and configure any State of Ohio Educational Network switches required to access the ITC-Site or the State of Ohio IVDL Network.

L. Patch cords
   1. It is this contractor's responsibility to install all patch cords needed to activate ports indicated in the Drawings. The contractor is responsible for determining the length and quantity of patch cords for a neat and clean installation. Typically, 3 foot patch cords will be sufficient to patch data switches to patch panels in racks. Provide longer patch cords as needed. Match cord category to the existing horizontal cabling channel category.
   2. Patch cords are not to be run in front of/across other equipment.
   3. Zig-zagging patch cords in wire management will not be permitted.

M. Miscellaneous Equipment
   1. Provide all miscellaneous equipment such as identification tags, cable tie, wiring harnesses, patch cables, Cat 6a and fiber complete for a complete system.

N. Initiate communication & coordinate with electrical contractor to install appropriate outlet for UPS provided.

O. The equipment racks shall be completely installed before any equipment is installed.

3.02 TESTING

A. The contractor shall be responsible for energizing and testing each run "end-to-end" at Architect/Engineer Technology Designer direction and verifying, in writing, that the data network system is in proper working condition.

B. After installation is complete, the system shall be tested and copies of the testing records shall be marked post measurements and supplied to the Architect/Engineer Technology Designer and Owner.

C. Verify and demonstrate to Architect/Engineer Technology Designer proper operation of all switches, access points, VLAN's, QoS levels, routing, and WAN connectivity.

D. Contractor shall demonstrate operation of management interfaces to the Architect/Engineer Technology Designer and the Owner for the Core switch/edge switches and UPS Management for all UPS's.

3.03 LABELING AND MARKING

A. Contractor shall follow the 2023 National Electrical Code and the ANSI/TIA/EIA-606-B Standard for labeling.

B. Contractor shall provide a typed schedule of all data ports on the patch cables and on the switches and according to each related room jack designation for all distribution switches, in accordance with Owner's requirements.

C. Switches shall be labeled with VLAN network name (Refer to Part 3.01 paragraph C) VLAN ID and IP address.

D. Label all power cables at the point of connection to powers strips with an identifier that corresponds with the device label on the front of the rack.

3.04 TRAINING

A. Provide a minimum of forty (40) hours of training for the District's personnel on the operation and maintenance of the systems.

B. Refer to submittals section of this Specification for information on training syllabus requirements.

C. Contractor shall provide two (2) video copies of all training.

3.05 QUANTITIES

A. Refer to Drawings and this Specification for active data port/quantity requirements.

END OF SECTION 27 21 00

SECTION 27 21 33
WIRELESS DATA COMMUNICATIONS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the work of this section.

1.02 SECTION INCLUDES

A. Wireless Data Communications System - Owner Managed
   1. Indoor Access Points
   2. Outdoor Access Points

1.03 RELATED REQUIREMENTS

1.04 DESCRIPTION OF WORK

A. Owner Managed Wireless Data Communications System
   1. Provide labor, material, equipment and accessories necessary for a complete operable wireless data communications system. The contractor shall furnish the equipment, accessories and necessary material as described herein.
   2. The contractor shall include programming and complete testing of the wireless data communications system (with all devices connected to it, as computers, printers, etc.). Network configuration of the Ethernet network system shall be per Owner's requirements.
   3. Make available business hours standard technical support, 7 X 24 emergency technical support and software support (including revisions, fixes and upgrades) upon expiration of the three year warranty period for all hardware and software purchased in this section.

1.05 QUALITY ASSURANCE

A. All equipment shall be UL Listed.

B. All equipment and Installation Practices shall comply with the latest ANSI/NFPA-70 National Electrical Code.

C. All equipment Installation Practices shall comply with the Local Electric Code.

D. All equipment shall comply with the latest ANSI-J-STD-607-C Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications Standard.

E. All equipment and Installation Practices shall comply with the BICSI 14th Edition TDMM.

F. All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607 and 862 standards.
   1. All equipment shall provide protection and containment of unwanted wireless signals and prevent student access to unwanted networks and content, in accordance with CIPA requirements.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Subcontractors
      c. Garmann/Miller Technology Designer

d. Construction Manager
e. Fort Loramie Local School District Board of Education - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.07 SUBMITTALS

A. Prior to Commencement of Work
1. Shop Drawings - Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
a. Provide catalog cuts of products in PDF format for review in the format required by the project front-end Specifications. All products provided must be clearly identified in submittal documents. Final copies shall be electronic and hard copy.
b. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.
c. Provide Schematic Drawings indicating the network configuration for review and approval before starting the final programming and connections of the system.
d. Provide schematic Drawings showing the following based on a preliminary wireless design of the building with proposed equipment: Access point locations to assure coverage as outlined in this Specification Section. Wi-Fi maps showing the anticipated performance and signal coverage at each standard to include 802.11 a/g/n/ac/ax.

B. Post Construction
1. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
2. Complete Drawings indicating the interconnection of all equipment.
3. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.
4. Operation & Maintenance Manuals
a. Provide complete O & Ms. One hard copy and PDF format.
b. Both formats shall be fully indexed by Section Name/System/Device.

1.08 WARRANTY

A. The Wireless Data Communications and all associated equipment shall be warranted by the contractor for a period of three (3) years from date of substantial completion. Provide advanced replacement for all Wireless Data Communications for the three (3) year period.

B. All repair and replacement parts shall be new from the manufacturer during the warranty period.

1.09 EXTRA MATERIALS

A. Maintenance Stock
1. Turn over any accessories to the Owner as attic stock.

B. In addition to the access points indicated on drawings provide two, (2) spare internal access points.

C. Obtain Owner's signature acknowledging receipt of extra stock.

PART 2 PRODUCTS

2.01 WIRELESS DATA COMMUNICATIONS - OWNER MANAGED

A. Approved Manufacturers
1. Meraki

B. General - Wireless Data Communication System

1. Provide Centrally Powered, 802.11a/g/n/ax Wireless Access Points and associated. Wireless Network Controller(s), to support wireless Network Devices and Phones throughout the building and the associated campus.
2. Connect the APs (Access Points) to the IP network via an 802.3af/at Power over Ethernet (PoE) switch port.

C. Provide minimum of -65dB signal level at all locations in building for 802.11a/g/n/ax coverage.

D. Supply sufficient quantity of access points to provide for expected throughput and load sharing.

E. Wireless Access Points
1. Provide centrally powered IEEE 802.11 a/g/n/ax Wireless Access Points (AP's) equipped for maximum bandwidth.
2. Provide support for 802.11ax standard.
3. The AP's shall provide for rapid traffic forwarding capabilities that will enable the Access Points to support real-time voice, video and data services.
4. Each AP shall be aware of neighboring access points, enabling effective real-time, and air traffic-management through load balancing.
5. Clients shall be routed around a failed access point to the closest available alternative on a real-time basis without manual intervention.
6. Each Access Point shall support a minimum of 14 VoWLAN Phones and dynamically throttle back non-VoIP traffic.
7. The AP's shall conform to the following for IEEE 802.11a/g/n/ac/ax operation:
   a. 802.11a
      1) Data rate: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps
      2) Frequency band: 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, 5.725 - 5.850 GHz
      3) Orthogonal Frequency Division Multiplexing (OFDM)
      4) Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)
      5) Non-overlapping channels: 13
      6) Typical receiver sensitivity: -72dBm at 54Mbps, -73dBm at 48Mbps, -78dBm at 36Mbps, -82dBm at 24Mbps, -83dBm at 18Mbps, -85dBm at 12Mbps, -88dBm at 9Mbps, -90dBm at 6Mbps
      7) Transmit Power: 5.150 to 5.250 GHz, 50 mW, 5.250 to 5.350 GHz, 50 mW, 5.725 to 5.850 GHz, 50 mW
      8) Typical coverage: 130ft (40m) at 11Mbps, 350ft (107m) at 1Mbps
   b. 802.11g
      1) Data rate: 1, 2, 5.5, 11, 12, 18, 24, 36, 48 and 54 Mbps
      2) Frequency band: 2.4 - 2.4835 GHz
      3) Direct Sequence Spread Spectrum
      4) Orthogonal Frequency Division Multiplexing (OFDM)
      5) Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)
      6) Non-overlapping channels: 3
      7) Typical receiver sensitivity: -72dBm at 54Mbps, -76dBm at 48Mbps, -82dBm at 36Mbps, -85dBm at 24Mbps, -88dBm at 18Mbps, -90dBm at 12Mbps, -92dBm at 9Mbps, -92dBm at 6Mbps
      8) Transmit Power: 100mW (20dBm), 50mW (17dBm), 30mW (15dBm), 20mW (13dBm), 5mW (7dBm), and 1mW (0dBm)
   c. 802.11n Data Rates

MCS Index	Spatial Streams	Data Rate Mb/s

		20 MHz Channel		40 MHz Channel	
		800ns GI | 400ns GI		800ns GI | 400ns GI	
0	1	6.5	7.2	13.5	15
1	1	13	14.4	27	30
2	1	19.5	21.7	40.5	45
3	1	26	28.9	54	60
4	1	39	43.3	81	90
5	1	52	57.8	108	120
6	1	58.5	65	121.5	135
7	1	65	72.2	135	150
8	2	13	14.4	27	30
9	2	26	28.9	54	60
10	2	39	43.3	81	90
11	2	52	57.8	108	120
12	2	78	86.7	162	180
13	2	104	115.6	216	240
14	2	117	130	243	270
15	2	130	144.4	270	300

d. 802.11ac Data Rates

	MCS	Mod. Type	Coding Rate	20 MHz Channel		40 MHz Channel		80 MHz Channel		160 MHz Channel	
			800 ns GI	400 ns GI	800 ns GI	400 ns GI	800 ns GI	400 ns GI	800 ns GI	400 ns GI
0	BPSK	1/2	6.5	7.2	13.5	15	29.3	32.5	58.5	65
1	QPSK	1/2	13	14.4	27	30	58.5	65	117	130
2	QPSK	3/4	19.5	21.7	40.5	45	87.8	97.5	175.5	195
3	16-QAM	1/2	26	28.9	54	60	117	130	234	260
4	16-QAM	3/4	39	43.3	81	90	175.5	195	351	390
5	64-QAM	2/3	52	57.8	108	120	234	260	468	520
6	64-QAM	3/4	58.5	65	121.5	135	263.3	292.5	526.5	585
7	64-QAM	5/6	65	72.2	135	150	292.5	325	585	650
8	256-QAM	3/4	78	86.7	162	180	351	390	702	780
9	256-QAM	5/6	na	na	180	200	390	433.3	780	866.7

8. All Power over Ethernet devices shall be IEEE 802.3at compliant.

9. Provide lockable surface mount access point enclosures (keyed alike) for all access points in locker rooms and gymnasiums or as noted on Drawings. Must accommodate access point and surface mount cabling outlet. Approved Manufacturers: Panduit - Panzone, Oberon - Multi Vendor Wall Enclosure, or access point manufacturer enclosures.
10. Provide channel approved or component certified patch cables and pass-through couplers to connect each access point to horizontal cabling (match jacket color and category of horizontal cabling). Provide plenum rated jacket if required by the 2023 National Electrical Code.
11. Standard for indoor access points: Dual-band controller-based 802.11a/g/n/ax MU-MIMO 4X4:4 Access Points. Approved Manufacturers:
    a. Meraki - MR44- Dual band Access Point
12. Telecommunications Rooms
    a. Telecommunications Room 1 - Room A115
13. Provide indoor access points per Unit Drawings.
14. Provide outdoor access points per Specifications.
15. Standard for outdoor access points Approved Manufacturers:
    a. Meraki MR86 Dual Band Outdoor Access Point
    b. Provide outdoor access points per drawings.
        1) Provide a 12" X 14" X 6" NEMA 4 lockable non-metallic enclosure to house the outdoor access points. Provide appropriate pathways from this enclosure to an outdoor weatherhead where omni and panel antennas are to be mounted. Provide power strip capable of reaching existing electrical outlet in the press box.
        2) Standard for outdoor antenna (Sector-coverage application): Cisco 2.4 GHz 90 degree Sector antennas - AIR-ANT2414S-R.Adjust antennas for appropriate coverage. Meraki to provide appropriate sector and or omni n-type antennas, Brocade - ML-2452-PNA7-01, Extreme Networks ML2452PNA501R/ML-2452-PNA5-01R Dual Band Panel: Connector Type N-Male

PART 3 EXECUTION

3.01 INSTALLATION

A. The contractor's commencement of equipment installation indicates acceptance of the telecommunications infrastructure and conditions.

B. Perform an RF Survey to verify complete coverage.

C. Install outdoor wireless access points above accessible ceiling where required (Typically APs serving outdoor antennas) - access points to be controlled through network.

D. Coordinate VPN, firewall and security settings/requirements with Owner - EAP authentication required.

E. No fiber optic cable shall be connected to a fiber patch cable or other device without a prior inspection by an IEC 61300-3-35 compliant indirect microscope and obtain a passing test result.

F. Provide coverage for entire building and perimeter area.

G. Coordinate with local Law Enforcement and safety forces regarding their requirements for remote and wireless access into building security and energy management systems. Law Enforcement and Safety Forces are responsible for providing their own remote access equipment.

H. Provide external antennas and appropriate lightning protection.

I. The building floor plans and site plans shall be entered into the wireless management system.

J. The wireless management system floor and site plans shall be calibrated after installation has been performed.

K. Balance wireless access points to insure complete coverage with minimal service degradation.

L. Setup wireless access security - Guest, Student & Staff SSIDs, VLANs and EAP authentication (Enterprise mode). Coordinate with ITC site on authentication items. Configure the wireless management server and integrate with the owner's existing domain server(s).

M. Determine the optimum location of all devices in the wireless LAN coverage areas and consider the access point density and location.

N. Locate all internal access points below the ceiling tile grid wherever possible.

O. Connect the external antennas to AP's mounted inside the building.

P. System time shall be synchronized from the District's designated network time protocol Server(s).

Q. Velcro straps (neutral color) shall be used to dress all exposed cabling.

3.02 TESTING

A. Perform a complete site survey after system placement and verify coverage, MCS and throughput.
   1. There shall be at least three test points in each room. (Recommendation only for ITC Site)
   2. Coverage to be surveyed for 2.4 GHz and 5 GHz bands.

3.03 LABELING AND MARKING

A. Cables, jacks, system components, etc. shall be labeled according to ANSI/EIA/TIA-606 Specifications and in coordination with the Owner & Architect/Engineer Technology Designer. APs shall have a label visible from occupied space and a matching label on the patch panel & switch port.

B. All AP cables shall be equipped with a self-laminating, wrap-around, machine printed label at both ends of the cable.

C. APs shall be labeled with a distinct AP ID number, This same number shall appear on serving switch port and the Wireless Management system. Labels shall be printed per Section 3.03 Article A.

3.04 TRAINING

A. Contractor shall provide a minimum of four (4) 1-hour, end user system training classes, twenty hours (20) of system programming and administration training to the District. Training shall be provided to all staff and shall be scheduled in advance with the District.
   1. Refer to Submittals section of this Specification for Training Syllabus requirements.
   2. Contractor shall provide two (2) video copies of all training.

3.05 QUANTITIES

A. Refer to Drawings, and this Specification for requirements/quantities.

END OF SECTION 27 21 33

SECTION 27 51 20
LOCKER ROOM SOUND SYSTEM

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, and of Sections 26 0101, 26 0550, are included as a part of this Section as though bound herein.

B. 27 05 26 Grounding and Bonding for Communication Systems.

1.02 DESCRIPTION OF WORK

A. The Contractor shall furnish the equipment, accessories, and necessary material for a complete system as indicated on the Drawings and described herein.

B. The new system shall consist of the following: A rack amplifier, speakers, and associated material, hardware, and wiring necessary for a complete, satisfactorily installed operating system which meets specified requirements.

C. Refer to E Drawings for pathway details to be utilized for system installation.

1.03 SECTION INCLUDES:

A. Wall Mounted Rack

B. Surge Protection

C. Power Sequencer

D. Remote switch

E. Amplifier/DSP

F. Wall Mount Speakers

G. Mixer

H. CD Player with Bluetooth/USB

I. Bluetooth Connectivity

J. Input/output Plates

K. System Cabling & Connectors

1.04 SUBMITTALS

A. Prior to commencement of work.
   1. Shop Drawings - Refer to Section 01 3000 - Administrative Requirements, for submittal procedures. Submit shop Drawings including product data sheets and wiring diagrams and shall include the following:
      a. **A complete bill of materials with model and part numbers and reference to the Specification paragraph number.**
      b. A complete set of detailed manufacturers Specifications describing and illustrating all standard and special components and materials.
      c. Provide 1/8 inch = 1'-0" Drawings stipulating devices and wiring for review. Provide One-Line diagrams showing sound system components and cabling for complete system connections. Include a front view of sound system racks on One-Line.

B. Post Construction
   1. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
   2. Operation & Maintenance Manuals

a. Provide complete O & Ms. One hard copy and PDF format.
b. Both formats shall be fully indexed by Section Name/System/Device.

3. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
1. Attendance required
a. Contractor and contractor's on-site project manager
b. Related Subcontractors
c. Garmann/Miller Technology Designer
d. Construction Manager
e. Fort Loramie Local School District Board of Education - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.06 QUALITY ASSURANCE

A. Equipment and components within the equipment shall be approved by UL, and shall meet National, State, and Local Requirements including the 2023 National Electrical Code.

B. NFPA 70 - National Electric Code.

C. Underwriter's Laboratory.

D. ANSI/TIA/EIA-606-B for system records and labeling

E. ANSI J-STD-607-A Telecommunications Bonding & Grounding.

F. BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual)

G. Americans with Disabilities Act.

H. Federal Communications Commission Part 15.

I. Sound System Engineering (Davis & Patronis) - 4th Edition 2013

J. Audio Systems Design and Installation (Giddings) 1990

1.07 WARRANTY

A. The system is to be left in first class operating condition and the Contractor is to warrant equipment for a period of three (3) years from date of Substantial Completion against defective materials, design, and workmanship.

B. Upon receipt of notice from Owner of failure of any part of the new equipment during the warranty period, these parts shall be replaced at no cost to the Owner.

PART 2 PRODUCTS

2.01 PROVIDE THE FOLLOWING SYSTEM:

A. One (1) Middle Atlantic EWR-10-22SD 10RU, 22-inch deep wall mounted rack with back box/section, pivoting mid section, front door. Equals by Lowell, Raxxess .
1. Provide optional locking front door.
2. Middle Atlantic WSB series steel panel blank fillers. Fill unused spaces in rack with blank fillers as required. Equals by Lowell, Raxxess.
3. One (1) Middle Atlantic UD2 2RU rack drawer. Equals by Lowell, Raxxess.
4. One (1) Middle Atlantic PDS-615R 15-amp Rack Mountable Power Sequencer with remote switch. Equals by Furman, Lowell, Raxxess, Atlas.
a. Single circuit.

b. Six rear NEMA 5-15R receptacles with adjustable 6-step sequencing.
c. U.L. Listed.
d. Provide remote switch equal to Middle Atlantic USC-SW.

5. One Middle Atlantic PD-915R 15-amp Rack-mount Power Strip with Surge Protection.
   a. 9' power cord.
   b. One front outlet, eight rear outlets, NEMA 5-15R receptacles.
   c. Front circuit breaker.

B. One (1) Dynacord C2800FDi DSP power amplifier 2x1400W. Equals by Crown, Lab Gruppen, Crest.

C. Two (2) Electro-Voice EVC-1122-95B 12" 2-way loudspeakers. Equals by JBL Renkus-Heinz, One Systems.
   1. Denoted as Speaker Type 'S1' on the Drawings.
   2. Speakers shall be black in color.
   3. Provide wall mount kit or suspend from ceiling to the elevation indicated on plans, provide hardware as necessary.

D. One (1) Shure SCM262 8-CH Rack Mountable mixer. Equals by Rolls, Ashly.
   1. Provide rack mount kit.

E. One (1) Denon DN-700CB CD Player with Bluetooth/USB.

F. Bluetooth connectivity equal to the following:
   1. One (1) RDL DB-BTN21 wall mounted Bluetooth Audio Format-A Interface. Device shall include pairing button and indicator lights.
   2. One (1) RDL TX-TPR2A Format-A Two-Pair Receiver.
      a. Mount device inside back of sound system rack.
   3. One (1) RDL PS-24AS 24Vdc Switching Power Supply.

G. One (1) Speaker Level Input Interface: Matches a 100, 70, or 25 volt speaker line to any unbalanced line-level audio input, Trimmer adjust output level for various input voltage/power levels, Frequency Response = 20 Hz-20kHz (+/_0.5dB), THD = < 0.05% (1kHz).
   1. Equal to RDL TX-70A
   2. Approved Manufacturers: Radio Design Labs, Edcor, Pro Co.

H. Wall Plates as necessary

I. 12/2 stranded copper conductors unshielded with overall jacket plenum rated speaker wire: 19x25 stranding, 0.012" nominal flex plenum PVC insulation material, 0.012" nominal flex plenum PVC jacket material, -10 to 60 degree C temperature rating, 300V RMS operating voltage rating, 33 pf/ft maximum capacitance @ 1 kHz between conductors, 1.7 ohm/1000' DC resistance.
   1. Approved Manufacturers: West Penn, Belden, Coleman, Windy City.

J. 18/2 stranded copper conductors shielded with overall jacket plenum rated mic wire: 7x28 stranding, 0.010" nominal flex plenum Teflon insulation material, 100% Aluminum Polyester Foil shield, Stranded Tin Copper drain, 0.015" nominal flex Copolymer plenum jacket material, -10 to 60 degree C temperature rating, 300V RMS operating voltage rating, 27 pf/ft maximum capacitance @ 1 kHz between conductors, 49 pf/ft capacitance between conductors to shield @ 1kHz, 10.5 ohm/1M' DC resistance @ 20deg C.
   1. Approved Manufacturers: West Penn, Belden, Coleman, Windy City.

K. Proco M-Series interconnect cables. Equals by Whirlwind, Hosa.
   1. Right angle XLR/1/4" cable connectors for mixing board connections (provide sufficient quantities of type required). XLR connectors: Neutrik NC3MRC, equals by Switchcraft, Jodavi. 1/4" connectors: Neutrik NP2RCS, equals by Switchcraft, Jodavi.

PART 3 PRODUCTS

3.01 INSTALLATION OF WIRING

A. Install and balance system volume levels.

B. Connect FM Tuner to external, building mounted FM Antenna and Distribution System. Ground Antenna in accordance with 2023 National Electrical Code and ANSI J-STD-607-A.

C. Ground equipment cabinet and associated equipment to cabinet mounted telecommunications grounding busbar in accordance with 2023 National Electrical Code and ANSI J-STD-607-A.

D. Check polarity of all speakers and adjust all microphone and source input levels.

E. All cable to be plenum rated.

F. Refer to Drawings, reviewed shop Drawings, and details for wiring types and quantities to be used for each circuit.

G. Wiring shall be installed in accordance with section 27 1005, and as indicated on the Drawings.

H. Coordinate and assist the fire alarm contractor for connections to the sound system to provide an auto-mute when the fire alarm system is activated.

I. Install in accordance with manufacturer's installation instructions and recommendations.

3.02 PERFORMANCE TESTING

A. Frequency response: 80Hz-14kHz +/- 3dB.

B. Loudness: At least 90dB-SPL program level with an additional 6dB crest factor.

C. Evenness of coverage: Variation of less than +/- 3dB (400Hz-4000Hz) at all seats.

D. System shall auto-mute with activation of fire alarm system.

3.03 TRAINING

A. Provide two (2) hours training for District's personnel on the operation, programming and maintenance of the system and two (2) additional training hours one (1) year post installation.

B. Provide two (2) video copies of all training.

END OF SECTION 27 51 20

SECTION 27 51 24
ATHLETIC COMPLEX SOUND SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, and of Sections 26 0101, 26 0550, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work under this Section.

C. 27 0526 Grounding and Bonding for Communication Systems.

1.02 DESCRIPTION OF WORK

A. The Contractor shall furnish the equipment, accessories, and necessary material for a complete system as indicated on the Drawings and described herein.

B. The new system shall consist of the following: A rack amplifier, speakers, and associated material, hardware, and wiring necessary for a complete, satisfactorily installed operating system which meets specified requirements.

C. Refer to E1 Drawings for pathway details to be utilized for system installation.

1.03 SECTION INCLUDES:

A. Stationary Rack

B. Speaker DSP/Mixer

C. Amplifiers

D. Bleacher Speakers

E. Center Court Speakers

F. CD/Media Player

G. Paging System Input

H. Wireless Handheld Mic System

I. Remote Switch

J. Power Sequencers

K. Input/output plates

L. Custom cables for rack to wall connections

M. System cabling

1.04 SUBMITTALS

A. Prior to commencement of work.

1. Shop Drawings - Refer to Section 01 3000 - Administrative Requirements, for submittal procedures. Submit shop Drawings including product data sheets and wiring diagrams and shall include the following:
    a. **A complete bill of materials with model and part numbers and reference to the Specification paragraph number.**
    b. A complete set of detailed manufacturers Specifications describing and illustrating all standard and special components and materials.
    c. Provide 1/8 inch = 1'-0" Drawings stipulating devices and wiring for review. Provide One-Line diagrams showing sound system components and cabling for complete system connections. Include a front view of sound system racks on One-Line.

B. Post Construction
   1. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
   2. Operation & Maintenance Manuals
      a. Provide complete O & Ms. One hard copy and PDF format.
      b. Both formats shall be fully indexed by Section Name/System/Device.
   3. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Fort Loramie Local School District Board of Education - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.06 QUALITY ASSURANCE

A. Equipment and components within the equipment shall be approved by UL, and shall meet National, State, and Local Requirements including the 2023 National Electrical Code.

B. NFPA 70 - National Electric Code.

C. Underwriter's Laboratory.

D. ANSI/TIA/EIA-606-B for system records and labeling

E. ANSI J-STD-607-A Telecommunications Bonding & Grounding.

F. BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual)

G. Americans with Disabilities Act.

H. Federal Communications Commission Part 15.

I. Sound System Engineering (Davis & Patronis) - 4th Edition 2013

J. Audio Systems Design and Installation (Giddings) 1990

1.07 WARRANTY

A. The system is to be left in first class operating condition and the Contractor is to warrant equipment for a period of three (3) years from date of Substantial Completion against defective materials, design, and workmanship.

B. Upon receipt of notice from Owner of failure of any part of the new equipment during the warranty period, these parts shall be replaced at no cost to the Owner.

PART 2 PRODUCTS

2.01 PROVIDE THE FOLLOWING SYSTEM:

A. One (1) Lowell LER-3522 35 RU stationary rack. Equals by Middle Atlantic, Raxxess.
   1. One (1) Lowell LFD-FV lockable perforated front door. Equals by Middle Atlantic, Raxxess.
   2. Lowell SEP series steel panel w/flange blank fillers. Fill unused spaces in rack with blank fillers as required. Equals by Middle Atlantic, Raxxess.

3. One (1) Lowell UDE series 3RU rack Drawer. Equals by Middle Atlantic, Raxxess.
4. One (1) Lowell US-214 14" deep shelf. Equals by Middle Atlantic, Raxxess.

B. One (1) Dynacord MXE-5 12x8 Mix/Matrix/DSP/Control. Equals by Allen & Heath, Tascam, Mackie, PreSonus, Yamaha, Soundcraft.
1. Provide rack mount kit.
2. One (1) TPC-1 Wall Control.
   a. Provide switchable speaker zones as follows:
      1) Room A105
      2) Room A106
      3) Room A120
   b. Mount controller to stationary rack blank plate.
3. Three (3) WPN1 Wall Controllers. Each wall controller to be programmed to adjust volume and source select in its respective space.
   a. One (1) to be located in Room A105.
   b. One (1) to be located in Room A106.
   c. One (1) to be located in Room A120.
   d. Finish to be White.
4. One (1) 5-Port Network Switch with POE with no EEE Power (Dante Approved).
   a. Mount in Rack.

C. Four (4) Dynacord C-2800FDi amplifers. Equals by Crown, Crest, Lab Gruppen.

D. Twelve (12) Electro-Voice EVC-1152-95B 15" 2-way loudspeakers. Equals by JBL Renkus-Heinz, One Systems.
1. Denoted as Speaker Type 'S1' on the Drawings.
2. Speakers shall be black in color.

E. Fifteen (15) Electro-Voice ZX1i-100 8" loudspeaker. Equals by JBL Renkus-Heinz, One Systems.
1. Denoted as Speaker Type 'WS' on the Drawings.
2. Speakers shall be black in color.

F. One (1) Denon DN-700CB CD/Media Player with Bluetooth receiver. Equals by Fostex, Tascam.

G. Three (3) RDL DB-BT1A Bluetooth Audio Input.
1. One (1) to be located in each room (Room A105, A106, and A120).
2. Provide each with RDL TX-TPR2A receiver and associated PS-24AS Power Supply.

H. Two (2) Electro-Voice RE3-ND76 wireless handheld microphone system. Equals by Shure, AKG, Audix, Audio Technica.
1. Shall be for Rooms A106 and A120.
2. Each to include rack mounted receiver and handheld transmitter with cardioid condenser microphone capsule.
3. Extend antennas to space as required.

I. One (1) Electro-Voice RE3-BPOL wireless lavalier microphone system. Equals by Shure, AKG, Audix, Audio Technica.
1. Shall be for Weight Room A105.
2. Include rack mounted receiver and handheld transmitter with cardioid condenser microphone capsule.
3. Extend antenna to space as required.

J. One (1) power sequencers/conditioners; 20 amp output, 3 adjustable delay banks (local or remote control), 10' captive 12 AWG power cord with NEMA 15 plug. Spike Protection Mode:

line to neutral, zero ground leakage. Maximum Continuous Operating Voltage: 139V RMS. Let Through Voltage (@125 amps, 8/20uS waveform): 188Vpk. Noise Attenuation: 10dB @ 10 kHz, 40 dB @ 100kHz, 50 dB @ 500 kHz. Rack mountable. Nine total outlets.

1. Approved Manufacturers: Furman, Middle Atlantic, Atlas.
2. One (1) Power Strips: single circuit, 20A, 120V, 12 outlet (6 - 20A, 120V duplex receptacles), housed inside a 16-gauge powder coated steel enclosure with 6' A/C cord.
    a. Approved Manufacturers: Raxxess, Lowell, Atlas, Middle Atlantic.

K. Three (3) Remote Switches; Heavy duty A/C master control panel. Panel shall be equipped with a lighted, front mount DPST type rocker switch for power activation and visual power identification via a red neon pilot light. Unit shall have eight grounded outlets (six switched and two non-switched) and one unswitched grounded front panel outlet. Power panel shall include a front mounted, 15 amp resettable circuit breaker and three pigtail power terminations. Power panel shall be rack mountable.

1. Provide necessary wiring from remote switches to power sequencer at stationary rack.
2. Approved Manufacturers: Atlas Sound, Furman, Middle Atlantic.

L. One (1) Speaker Level Input Interface: Matches a 100, 70, or 25 volt speaker line to any unbalanced line-level audio input, Trimmer adjust output level for various input voltage/power levels, Frequency Response = 20 Hz-20kHz (+/_0.5dB), THD = < 0.05% (1kHz).

1. Approved Manufacturers: Radio Design Labs, Edcor, Pro Co.

M. 12/2 stranded copper conductors unshielded with overall jacket plenum rated speaker wire: 19x25 stranding, 0.012" nominal flex plenum PVC insulation material, 0.012" nominal flex plenum PVC jacket material, -10 to 60 degree C temperature rating, 300V RMS operating voltage rating, 33 pf/ft maximum capacitance @ 1 kHz between conductors, 1.7 ohm/1000' DC resistance.

1. Approved Manufacturers: West Penn, Belden, Coleman, Windy City.

N. 18/2 stranded copper conductors shielded with overall jacket plenum rated mic wire: 7x28 stranding, 0.010" nominal flex plenum Teflon insulation material, 100% Aluminum Polyester Foil shield, Stranded Tin Copper drain, 0.015" nominal flex Copolmer plenum jacket material, -10 to 60 degree C temperature rating, 300V RMS operating voltage rating, 27 pf/ft maximum capacitance @ 1 kHz between conductors, 49 pf/ft capacitance between conductors to shield @ 1kHz, 10.5 ohm/1M' DC resistance @ 20deg C.

1. Approved Manufacturers: West Penn, Belden, Coleman, Windy City.

O. Pro Co interconnect cables. Equals by Whirlwind, Hosa

PART 3 EXECUTION

3.01 INSTALLATION

A. Install and balance system volume levels.

B. Adjust all wireless equipment and verify coverage areas.

C. Connect FM Tuner to external, building mounted FM Antenna and Distribution System. Ground Antenna in accordance with 2023 National Electrical Code and ANSI J-STD-607-A.

D. Ground equipment cabinet and associated equipment to cabinet mounted telecommunications grounding busbar in accordance with 2023 National Electrical Code and ANSI J-STD-607-A.

E. Check polarity of all speakers and adjust all microphone and source input levels.

F. All cable to be plenum rated.

G. Refer to Drawings, reviewed shop Drawings, and details for wiring types and quantities to be used for each circuit.

H. Wiring shall be installed in accordance with section 27 1005, and as indicated on the Drawings.

I. Provide connections from A/V equipment (provided by Div. 27) to mixing board.

J. Coordinate and assist the fire alarm contractor for connections to the sound system to provide an auto-mute when the fire alarm system is activated.

K. Install in accordance with manufacturer's installation instructions and recommendations.

3.02 PERFORMANCE TESTING

A. Frequency response:100Hz-14kHz +/- 3dB.

B. Loudness: At least 100dB-SPL program level with an additional 6dB Crest factor.

C. Evenness of coverage: Variation of less than +/-3dB (400Hz-4000Hz) at all seats.

D. System shall auto-mute with activation of fire alarm system.

3.03 TRAINING

A. Provide eight (8) hours training for District's personnel on the operation, programming and maintenance of the system and four (4) additional training hours one (1) year post installation.

B. Provide two (2) video copies of all training.

END OF SECTION 27 51 24

SECTION 27 53 13
CLOCK SYSTEM

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions and the Sections included under Division 1, General Requirements are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SECTION INCLUDES

A. Wireless Clocks and accessories

B. Ethernet Sourced Wireless Transmitter

1.03 QUALITY ASSURANCE

A. The clock system equipment shall be UL listed.

B. All equipment and installation practices shall comply with the latest ANSI/NFPA-70 National Electrical Code.

C. All equipment installation practices shall comply with the 2023 National Electrical Code and local electric code.

D. All equipment shall comply with the latest ANSI-J-STD-607-C Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications Standard.

E. All equipment and installation practices shall comply with the latest BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual).

F. All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607 and 862 standards.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Fort Loramie Local School District Board of Education - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.05 SUBMITTALS

A. Prior of Commencement of Work
   1. Shop Drawings - Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
      a. Provide catalog cuts of products for review in the format required by the project front-end Specifications. All products provided must be clearly identified in submittal documents.
      b. Complete and comprehensive Equipment Catalog Specification Sheets of each component provided.
      c. Provide a projected coverage map using the default transmitter on the building footprint.

d. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.
e. If a product is manufacturer discontinued, provide the manufacturer recommended direct replacement cut sheet and note as "Replacement for discontinued item".

B. Post Construction
1. Contractor to submit training syllabus to the Architect/Engineer Technology Designer for approval at least 2 weeks prior to commencement of training sessions.
2. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
3. Operation & Maintenance Manuals
a. Provide complete O & Ms. One hard copy and PDF format.
b. Both formats shall be fully indexed by Section Name/System/Device.
4. Complete record Drawings indicating the interconnection of all equipment.
5. Operating License: Submit evidence of application for FCC Radio Station Authorization prior to installing equipment. Furnish the license or a copy of the application for the license, to the Owner/End User prior to operating the equipment. The original license must be delivered to the Owner/End User.
6. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
7. Operation & Maintenance Manuals
a. Provide complete O & Ms. One hard copy and PDF format.
b. Both formats shall be fully indexed by Section Name/System/Device.
8. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.06 REGULATORY REQUIREMENTS

A. Equipment and components furnished shall be of manufacturer's latest model.

B. The end user will hold a license, known as a "Radio Station Authorization" granted by the FCC or the manufacturer will provide a protected right to use of radio spectrum for the life of the installation.

C. This license grants the end user protected use for wireless transmission at the designated frequency.

D. This license will designate a unique "call sign" for each end user, unless it is a manufacturer license.

E. Transmitter and receiver shall comply with Part 90 of FCC rules as follows:
1. This device may not cause harmful interference, and
2. This device must accept interference received, including interference that may cause undesired operation.
3. Transmitter frequency shall be governed by FCC Part 90.35.
4. Transmitter output power shall be governed by FCC Part 90 257 (b) and Part 74.
5. System shall be installed in compliance with local and state authorities having jurisdiction.

1.07 WARRANTY

A. Components, parts, and assemblies supplied by the manufacturer shall be warranted against defects in materials and workmanship for a period of three (3) years from date of completion. Warranty services shall be provided during normal working hours. The representative shall be based in a fully staffed branch office and located within a reasonable distance from the job site.

1.08 EXTRA MATERIALS

A. Obtain Owner's signature acknowledging receipt of extra stock.

PART 2 PRODUCTS

2.01 GENERAL

A. Synchronize clock system with the United States Atomic Clock via GPS/NTP receiver with external antenna.

B. Self-correcting for Daylight Savings Time changes.

C. Provide new Clocks per Drawings and Specifications.

2.02 WIRELESS CLOCKS

A. LED CLOCKS
   1. 4 digit, 4" character height for corridors (double faced).
      a. 4" character height
      b. Wall Mount
      c. 120 VAC 50-60 Cycle
         1) If 24 VAC is to be used, the clock contractor is responsible for stepping power down. Division 26 will be providing 120 VAC.
         2) UL/cUL listed power supply must be used.
      d. Ability to synchronize over radio frequency transmission.
      e. LED dimmer options: 100%, 75%, 50%, or 25%.
      f. Approved Manufacturers:
         1) Primex - SNS7B201

2.03 TRANSMITTER WITH NTP (ETHERNET) RECEIVER

A. Wireless system

B. Provide central transmitter with dual NTP (Network Time Server) sources to provide complete wireless coverage of entire building. Provide appropriate size antennas, transmitters and/or repeaters required for complete coverage of the building.
   1. It is strongly recommended that this contractor coordinate the transmitter output power with the manufacture to ensure complete coverage of the building.

C. If transmitter form factor is not compatible with rack mounting (i.e. antenna creates a cabling or equipment pathway obstruction, provide wall-mount shelf for transmitter.

D. Approved Manufacturers:
   1. Primex XR Series Transmitter

PART 3 EXECUTION

3.01 INSTALLATION

A. Install per manufacturer's recommendations.

B. Mount antennas in order to insure adequate signal coverage, provide plenum cabling and any antenna specific pathways (including sleeves for external wall penetrations).

C. Securely mount the clocks flush on the walls in classrooms and office areas.

D. All clocks shall be capable of synchronization from the host transmitter as installed in rooms.

E. GPS and transmitter cable shields must be grounded to the Telecommunication Main Ground Busbar in the producer section (furthest to the right-hand end of the busbar). Any deviation from this grounding practice requires approval of the Architect/Engineer Technology Designer.

F. Cable ties and tape are not permitted for securing cable coils or supporting cabling in any way during installation, be it temporary or permanent, on any indoor cabling.

G. Cable ties may only be used to secure cabling outdoors. Cable tie ends shall be cleanly cut with flush cutters.

H. Coordinate with other Technology contractors whose equipment requires a network clock input (i.e. paging/central sound system, telephone system, data network equipment, audio/visual equipment, etc.)

3.02 TRAINING

A. Provide four (4) hours training for owner's personnel on the operation, programming and maintenance of the system.

B. Refer to Submittals section of this Specification for training syllabus requirements.

C. Provide two (2) video copies of all training. Also encode training onto Digital Media Management server and add to system as video asset.

3.03 QUANTITIES

A. Provide quantities per Specifications and Drawings.

B. Refer to Extra Materials section of this Specification for additional requirements.

END OF SECTION 27 53 13

SECTION 28 16 01
SECURITY/ACCESS CONTROL

PART 1 GENERAL

1.01 SUMMARY

A. Provide a complete addressable intrusion detection system and complete access control system.

1.02 RELATED DOCUMENTS

A. Refer to "Instructions to Bidders, General Conditions, and General Requirements," which form a part of this Specification.

1.03 DESCRIPTION OF WORK

A. Provide an alarm monitoring system as shown on the Drawings.

B. The Intrusion Detection System shall include, but not be limited to, the following:
   1. System Controllers
   2. Door Contacts
   3. Keypads
   4. Egress Motion Detectors
   5. Motion Detectors (Ceiling and Wall Mounted Detectors)
   6. Various relay outputs (Distributed Antenna System monitoring-reporting)
   7. Installation, inspection, and testing

C. The Access Control System shall include, but not be limited to, the following:
   1. System Controller
   2. Software for Access Control system (Server and clients)
   3. Distributed IP based Access Control Hubs/Controllers
   4. FOBs or Access cards (per owner preference)
   5. Card Readers
   6. Installation, inspection, and testing

D. This must be an Integrated Security and Access Control System

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1.04 QUALITY ASSURANCE

A. All equipment and installation practices shall comply with the latest ANSI/NFPA-70 National Electrical Code.

B. All equipment installation practices shall comply with the 2023 National Electrical Code and local electric code.

C. All equipment shall comply with the latest ANSI-J-STD-607-C Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications Standard.

D. All equipment and installation practices shall comply with the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual).

E. All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607 and 862 standards.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
   1. Attendance required
      a. Contractor and contractor's on-site project manager

b. Related Subcontractors
c. Garmann/Miller Technology Designer
d. Construction Manager
e. Fort Loramie Local School District Board of Education - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.06 SUBMITTALS

A. Prior of Commencement of Work
1. Shop Drawings -Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
a. Provide catalog cuts of products for review in the format required by the project front-end Specifications. All products provided must be clearly identified in submittal documents.
b. Complete and comprehensive Equipment Catalog Specification Sheets of each component provided.
c. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.
d. If a product is manufacturer discontinued, provide the manufacturer recommended direct replacement cut sheet and note as "Replacement for discontinued item".

B. Post Construction
1. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
2. Complete record Drawings indicating the interconnection of all equipment.
3. Operation & Maintenance Manuals
a. Provide complete O & Ms. One hard copy and PDF format.
b. Both formats shall be fully indexed by Section Name/System/Device.
4. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.07 WARRANTY

A. Components, parts, and assemblies supplied by the manufacturer shall be warranted against defects in materials and workmanship for a period of three (3) years from date of completion. Warranty services shall be provided during normal working hours. The representative shall be based in a fully staffed branch office and located within a reasonable distance from the job site.

B. All repair and replacement parts shall be new from the manufacturer during the warranty period.

1.08 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following for Security:
1. Digital Security Controls Ltd. (DSC)
2. Ademco Systems
3. Bosch

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following for Access Door Control:
1. Kantech Systems - Basis of Design

PART 2 PRODUCTS & OPERATION

2.01 INTRUSION DETECTION SYSTEM

A. Security System Controller

1. System controller shall be microprocessor-based with battery backup to allow a minimum of 24 hours of data integrity. System shall have 16 zones expandable to a minimum of 64, definable user codes, 12 multiple levels of authority, 128 event minimum history log, and ability to connect up to 8 supervised keypads. All zones shall be fully supervised and programmable. Panel shall be complete with integral power supply and supervised battery charger, auxiliary power for powering security detection devices, integral supervised digital alarm communicator, supervised bell/siren output, and two general purpose programmable outputs which can be programmed as general purpose outputs or as the systems addressable loops. The system shall be capable of reporting all alarms, trouble, and system status information by combinations of all communication methods installed including: digital communicator, a cellular transmitter, SMS messaging and DVAC.

B. System Printer
   1. The system shall be capable of including a serial output for a hard copy printer installed anywhere on the Communications bus. All system events, alarms, and restorals shall be printed and each event shall include the partition, date, and time.

C. Provide a concealed Panic button at each administrative entrance (two) capable of summoning law enforcement.

D. System Keypads
   1. The system shall accommodate up to 8 LCD keypads, which are powered from the base panel. LCD keypads shall have a display capacity of at least 32 alphanumeric characters with adjustable brightness and contrast. Keys shall be backlit for low light level ease of use. Keypads shall include individual "Armed," "Ready," and "Trouble" indicators, three keypad activated alarm keys, and five programmable "function" keys.

E. User Codes
   1. The system shall provide for 1,000 user codes selectable as either 4 or 6 digits. For Access Control, user codes shall be assignable to 1 of 64 access levels. User codes shall be assignable to one of multiple partitions.

F. Partitions
   1. The system shall be programmable for up to 8 fully independent partitions each partition shall have its own account code. Keypads shall be assignable as "partition" keypads or "global" keypads. Integrate with Access. Each zone in the system shall be assignable to one or more partitions.

G. Central Station Reporting/Digital Communicator
   1. The system shall provide high speed 20 bps 1400/2300 Hz. handshake, contact ID and SIA reporting formats and shall be capable of being programmed to call up to 3 telephone numbers. The system shall also allow communication to a pager. The telephone numbers shall be programmable for 'backup' dialing should the primary number fail. The system shall be programmable for split reporting such that alarms/restorals, openings/closing and miscellaneous events can be sent to different telephone numbers. The system shall report a separate account code for each partition and for non-partition (system) events.
   2. The system shall be capable of including up to 144 low power outputs with each output able to supply 50 mA at 12 VDC. Outputs shall be added in increments of 16 and may be added anywhere on the Communications bus.
   3. System shall have a digital communicator with phone lines to send alarm status to a central monitoring station. SMS messaging capability is also required.

H. Motion Detectors
   1. Corridor/Room Motion Detectors shall be Addressable Wall Mount Motion Detector. 2 Wire Addressable AMB 300.

2. Gym motion detectors to be wall mounted 2 wire addressable detectors. Mounting height to be 10' as per layout and have a wire guard protective cover. Detectors shall be AMD-300
3. Egress Motion Sensors shall be DSC-T.REX Exit Motion Detectors.

I. Door Contacts
1. Door contacts shall be 3/4" concealed for new doors.
2. Surface door contacts shall be screw mount type for existing doors.
3. Overhead garage doors shall have armor cable, surface mount, wide gap type contacts.

J. Supervision
1. Each zone in the system shall be supervised. The base panel and any remote panel with its own AC in put shall be supervised for AC loss. Batteries for the base panel and all remote panels shall be supervised for low power and be short circuit protected. Each addressable device and each wireless input device shall be supervised for its presence. The Combus bus shall be supervised for low voltage and the presence of each enrolled module and keypad. Digital alarm communicators shall be supervised for telephone line trouble and failure to communicate and the system shall report and cellular communication panel trouble.

K. Internal Clock
1. The system clock shall derive its time from the owner's NTP server. Provide all ports accessories and connections required to integrate to the NTP server. Coordinate work with the video contractor installing the NTP server.

2.02 ACCESS CONTROL SYSTEM

A. Access Control
1. Access control modules shall accept proximity readers, magnetic stripe readers, and 26 bit Wiegand readers.
2. Access control shall allow users to arm/disarm the security system while locking/unlocking the doors from outside the protected space. Users may use a valid card to disarm the system automatically while unlocking the door, to arm the system in combination with the arm pushbutton while locking the door, and to postpone autoarm in combination with the autoarm pushbutton.
3. Provide appropriate length patch cables and pass-through couplers to connect to the horizontal cabling. Patch Cables and pass-through couplers provided shall be channel approved or component certified to match the existing horizontal cabling channel category with a yellow jacket color. Coordinate channel manufacturer with the electrical contractor or section 27 1513 cabling contractor. Provide plenum rated jacket when when required by the 2017 National Electrical Code.

B. Card Readers
1. Entrance readers shall be indoor/outdoor with multiple card type ability, compatible with the system. Provide at locations shown on the Drawings. Default Color shall be black.
2. Event access control readers shall be indoor/outdoor with multiple card type ability, compatible with the system. Default Color shall be white.
3. Provide fifty (50) key chain fobs compatible with the system and readers.

C. Electric door strikes and associated power packs will be provided by others. Voltage shall be 24VDC. The electrical contractor shall connect from the power pack to the access control system.

D. Internal Clock

1. The system clock shall derive its time from the owner's NTP server. Provide all ports, accessories and connections required to integrate to the NTP server. Coordinate work with the Clock System contractor installing the NTP server.

E. Electronic Door Strikes and associated power packs to be provided by others. Voltage shall be 24VDC. Electrical Contractor shall connect from the power pack to the Access Control System.

F. Access control software shall be an integral component of the base software and shall provide the following functions:
   1. Capacity for 10,000 cards
   2. Unlimited access levels
   3. 365 individual daily schedules with 255 events per schedule
   4. Holiday scheduling for a two year period. Note: Holiday scheduling applications are not acceptable for use as event scheduling applications.
   5. Individual door unlock schedules with automatic daylight saving time adjust for all schedules. Timed unlock/lock schedules shall operate as required by owner.
   6. Access software shall have capability of both operating and administering multiple sites
   7. Access control system shall be supplied with a windows based badging system for future use.

2.03 NETWORK WIRING

A. Wiring shall conform to manufacturer's recommendations and meet 2023 National Electrical Code and NFPA standards.

B. Provide appropriate length patch cables and pass-through couplers to connect to the horizontal cabling. Patch Cables and pass-through couplers provided shall be channel approved or component certified to match the existing horizontal cabling channel category with a yellow jacket color. Coordinate channel manufacturer with the electrical contractor or section 27 1513 cabling contractor. Provide plenum rated jacket when when required by the 2017 National Electrical Code.

PART 3 EXECUTION

3.01 INSTALLATION

A. A complete, satisfactory operating security system shall be installed and tested to ensure proper operation.

B. All wiring inherent to, or used in conjunction with, the access control subsystem, the alarm monitoring subsystem and the system processor shall be in accordance with the National Electrical Code and all local electrical codes governing installation.

C. Manufacturer's representatives shall fully instruct personnel in all phases of equipment operation and maintenance upon completion of installation.

D. The access control system shall be managed by the Access Control Server.

E. The horizontal communications cabling provided will be terminated with field terminable adaptors. Provide patch cables and pass-through couplers if devices do not except field terminable adaptors.

F. Any patch cabling and or pass-through couplers needed for a complete and operational system is the responsibility of this contractor. Patch Cables and pass-through couplers provided shall be channel approved or component certified to match the existing horizontal cabling channel category with a yellow jacket color

3.02 PERFORMANCE REQUIREMENTS

A. Security System

1. In addition to Equipment Specifications this system shall perform to the following Specifications:
    a. All exterior doors equipped with egress motion detectors to exit the building without causing a "Forced Door Alarm. These are typically provided as a part of the door hardware. Coordinate with the door hardware provider for cabling requirements.
    b. All exterior doors shall cause a "Forced Door Alarm" if the door is opened without proper use of an access reader. Doors without readers shall provide a "Forced Door Alarm" in the event it is opened
    c. All Input Points on the security system shall be uniquely identified to the system. The only exception to this rule will be a location where you have a double entrance door. In this location one identification point shall be considered acceptable for these two doors.
    d. The system shall be capable of having points disabled to prevent "Forced Door Alarms" or "Door Ajar Alarms".
    e. The computer network shall be configured to work with Security/Access Control System for remote maintenance and history reports. Provide a web-based system.
    f. Access Control and security system shall have the software capability to be remotely programmed by security contractor.
2. Due to the nature of this system being for the sole purpose of security, bidder will NOT be allowed to subcontract work. All labor will be performed with the bidders own forces. Bidder will demonstrate that they are actively in the security business and have service 24 hours a day, 365 days a year. The exception to this Specification shall allow for electrical contractor to subcontract to the security system provider. However; security system provider shall not subcontract any portion of their bid package to Electrical Contractor to another contractor.

B. Access Control
1. In addition to Equipment Specifications this system shall perform to the following Specifications:
    a. The system shall require the use of an authorized proximity card at entry doors equipped with access readers.
    b. System shall be supplied with multi user client software for scheduling at no additional charge to customer, user access and other major access control. All software must include at least one Full version of each software component.
    c. Access Control and security system shall have the software capability to be remotely programmed by security contractor.
    d. Required Access Groups - Minimum
        1) Administration
        2) Teachers
        3) Custodian
        4) Maintenance
        5) Student
        6) Visitor - Commons
        7) Visitor - All access
        8) Additional groups as required by owner
    e. Implement Triple swipe/double tap feature for event door control
        1) Gymnasium Events
        2) Sports Practices
        3) Auditorium/Auditeria Events
        4) Emergency unlock facility-wide (for Fire and LEO AHJs upon AHJ request)

f. Due to the nature of this system being for the sole purpose of security, bidder will NOT be allowed to subcontract work. All labor will be performed with the bidders own forces. Bidder will demonstrate that they are actively in the security business and have service 24 hours a day, 365 days a year. The exception to this Specification shall allow for electrical contractor to subcontract to the security system provider. However; security system provider shall not subcontract any portion of their bid package to Electrical Contractor to another contractor.

3.03 TRAINING

A. Provide a total of forty (40) hours training for owner's personnel on the operation, programming and maintenance of the system. 8 hours at project turnover/completion, 8 hours at 3 months, 8 hours at 6 months, 8 hours at 1 year, 4 hours at 2 years, 4 hours at 3 years.

B. Manufacturer's representatives shall fully instruct personnel in all phases of equipment operation and maintenance upon completion of installation for at least 8 hours of the required training interval.

C. Provide two (2) video copies of all training.

END OF SECTION 28 16 01

SECTION 28 23 00
CCTV CAMERA SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered by this section shall include all labor, equipment, materials, and services required to furnish and install a complete IP based CCTV security system for the building project. 25041.00 Fort Loramie Local Schools Athletic Complex Building & Associated Improvements. The equipment shall consist of but not limited to the following:
   1. Pan Tilt Zoom Exterior Cameras and all Associated Wiring
   2. Fixed Exterior Cameras and all Associated Wiring
   3. IP Interior Cameras

B. All work specified here within shall be an IP based system running on building's network, and shall be viewed over the customer's Ethernet system. All exterior cameras to be mounted per drawings on light poles or the building and wiring to these are the responsibility of this contactor.

C. This system must integrate with the Security and Access Control Systems Division 28 1601.

1.02 CODES AND STANDARDS

A. All raceways and wiring shall be installed in accordance with the 2023 National Electrical Code.

B. The system installation shall comply with all other codes and authorities having jurisdiction.

1.03 SUBSTITUTIONS

A. This Specification lists the manufacturers name and catalog numbers of equipment to be provided. All model numbers specified are from the manufacturers below and will be accepted as an equal provided all Specifications are met.
   1. Axis Communications/exacq Technologies

B. CCTV installers intending to use substitutes shall provide a reference list of at least 2 installations within 1 hour ground travel from the project site using the proposed substitute equipment. The reference list shall include a one paragraph narrative of each sites system, as well as the name, address, telephone, and title of contact person and date system was placed into acceptable service by the Owner.

C. Requests for substitution must be accompanied by a matrix of products (from this Specification) and the manufacturer/model of each substituted product with cut sheets so the equality of the substitution(s) may be evaluated. Any product(s) were a substitution request is not made are assumed to be from the approved manufacturers/models with full compatibility with substituted products.

D. It is the contractor's responsibility to meet the entire intent of these Specifications. Deviations from the specified items shall be at the risk of the bidder until the date of final acceptance by the Architect/Engineer Technology Designer, and Owners representative. All costs for removal, relocation, or replacement of a substituted item shall be at the risk of the bidding contractor.

E. For equipment other than that specified, the bidder shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment. Contractor shall be responsible for all costs incurred for re-submittals due to non-compliance of these Specifications.

F. All equipment must be from one manufacturer to insure complete system compatibility unless otherwise indicated in this Specification.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Fort Loramie Local School District Board of Education - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.05 SUBMITTALS

A. Prior to Work Commencement
   1. Shop Drawings - Refer to Section 01 3000 - Administrative Requirements, for submittal procedures. Provide specification sheets for all equipment and components to be installed for approval. Submittals shall be manufacturers printed project data, catalog cuts, and description of any special installation procedures. Provide sample if requested.
   2. Provide list of rack mounted components and mount height in rack units (RUs) so the final rack layout can be coordinated by the Architect/Engineer Technology Designer.
   3. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.

B. Post Construction
   1. Contractor to submit training syllabus to the Architect/Engineer Technology Designer for approval at least 2 weeks prior to commencement of training sessions.
   2. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
   3. Operation & Maintenance Manuals
      a. Provide complete O & Ms. One hard copy and PDF format.
      b. Both formats shall be fully indexed by Section Name/System/Device.
   4. Complete record Drawings indicating the interconnection/location of all equipment, IP and MAC addresses assigned to networked equipment
   5. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.06 WARRANTY

A. Contractor shall guarantee the complete system for a period of three (3) years after date of final acceptance. Contractor shall repair or replace, as approved, any defective part or material, during the guarantee period at no cost to the Owner.

B. All repair and replacement parts shall be new from the manufacturer during the warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. AXIS Communications

2.02 OUTDOOR 180/270/360 DEGREE DOME CAMERAS

A. The IP camera dome shall transmit high quality video across the network for remote viewing and recording. It shall be ONVIF compliant.

B. The dome shall have a video transmission rate of 22 fps at 1280 X 800 pixels and capable of up to 30 fps.

C. 4 megapixel minimum (180 degree) and 8 megapixel (270/360 degree).

D. The camera shall be equipped with a varifocal lens 2.8mm -10mm minimum range

E. The dome shall use compression based on H.264/MPEG4 that optimizes data and maximizes picture quality.

F. Simultaneous transmission of multiple channel video across the LAN and WAN (Internet) to connected network digital video recorders and master workstations shall be provided.

G. The dome shall be configurable remotely from network digital video recorders and master workstations.

H. Programmable titling shall be provided for the camera and every preset position, alarm, relay, and sector. Titles shall be enabled or disabled individually or globally. The overall position of the titles and display frame position shall be programmable. The capability to fade titles after a programmable time shall be provided.

I. Museum search feature shall scan hours of video in minutes.jus

J. MD5 128-bit algorithm video authentication shall ensure data integrity.

K. The LAN interface shall be 1000 Mbps, TCP/IP unicast.

L. Video bandwidth shall be less than 10 Mbps (per video stream), nominal.

M. Adjustment of fps according to network performance capability shall not sacrifice quality.

N. An embedded self-supported OS shall be provided.

O. Provide appropriate wall or pole mount camera enclosures with heater/blower per manufacturer recommendations with mounting brackets (wall, corner, or pole mount as required).

P. Where cameras require corner mounts; provide Liquid Flexible Metal Conduit (LFMC) conduit from the back box to the camera. See specifications section 26 05 33 for more information.

Q. Approved Manufacturers 180 degree cameras:
   1. AXIS Communications - AXIS Q3819-PVE

R. Approved Manufacturers 270/360 degree cameras:
   1. AXIS P3717-PLE

2.03 OUTDOOR FIXED CAMERA DOME CAMERAS

A. The IP camera dome shall transmit high quality video across the network for remote viewing and recording. It shall be an ONVIF registered unit.

B. The dome shall have a video transmission rate of 22 fps at 1280 X 800 pixels and capable of up to 30 fps.

C. 4 megapixel minimum.

D. The dome shall use compression based on H.264/MPEG4 that optimizes data and maximizes picture quality.

E. Simultaneous transmission of multiple channel video across the LAN and WAN (Internet) to connected network digital video recorders and master workstations shall be provided.

F. The dome shall be configurable remotely from network digital video recorders and master workstations.

G. The dome shall be capable of 10 simultaneous viewing/recording streams per camera.

H. Programmable titling shall be provided for the camera and every preset position, alarm, relay, and sector. Titles shall be enabled or disabled individually or globally. The overall position of the titles and display frame position shall be programmable. The capability to fade titles after a programmable time shall be provided.

I. Museum search feature shall scan hours of video in minutes.

J. MD5 128-bit algorithm video authentication shall ensure data integrity.

K. The LAN interface shall be 100 Mbps, TCP/IP Unicast.

L. Video bandwidth shall be less than 12 Mbps (per video stream), nominal.

M. Adjustment of fps according to network performance capability shall not sacrifice quality.

N. An embedded self-supported OS shall be provided.

O. Alarm inputs shall be individually programmable for their functional state (enabled or disabled), reporting state (report on or off), active state (high or low), acknowledge mode (manual, momentary or automatic), automatic acknowledge dwell time control, set and reset action (action when triggered or reset) and displayed title text. The relay output shall be programmable for its power-on state (on or off), output type (momentary or latching) and displayed title text.

P. Provide appropriate wall or pole mount camera enclosures with heater/blower per manufacturer recommendations with mounting brackets (wall, corner, or pole mount as required). The combined assembly shall have an IK10 vandal resistance (impact) rating.

Q. Approved Manufacturers:
   1. AXIS Communications - P3267-LVE

2.04 MINIATURE FIXED POSITION CAMERA DOMES FOR INDOOR FIXED CAMERAS

A. The IP camera dome shall transmit high quality video across the network for remote viewing and recording. It shall be an ONVIF registered unit.

B. The dome shall have a video transmission rate of 22 fps at 1280 X 800 pixels and capable of up to 30 fps.

C. 4 megapixel minimum.

D. The dome shall use optimized compression based on H.264/MPEG4 that optimizes data and maximizes picture quality.

E. Simultaneous transmission of multiple channel video across the LAN and WAN (Internet) to connected network digital video recorders and master workstations shall be provided.

F. The dome shall be configurable remotely from network digital video recorders and master workstation.

G. Single channel audio for communications and recording shall be provided.
   1. Full time audio recording of every administrative reception area shall be provided in each building capturing and public reception area sound at a minimum. At the Owner's direction, this audio may be disabled if such recording is in conflict with written Owner privacy policy. Testing of audio recording functionality is still mandatory.
   2. Provide cabling and connection to central sound system and provide full time audio recording of announcements.

H. The dome shall be capable of 10 simultaneous viewing/recording streams per camera.

I. Museum Search (Smart Search) feature shall scan hours of video in minutes.

J. Programmable titling shall be provided for the camera and every preset position, alarm, relay, and sector. Titles shall be enabled or disabled individually or globally. The overall position of the titles and display frame position shall be programmable. The capability to fade titles after a programmable time shall be provided.

K. MD5 128-bit algorithm video authentication shall ensure data integrity.

L. The LAN interface shall be 100 Mbps, TCP/IP unicast

M. Video bandwidth shall be less than 12 Mbps (per video stream), nominal.

N. Up to 16 cameras shall be able to be displayed on a remote workstation.

O. Adjustment of fps according to network performance capability shall not sacrifice quality.

P. Control of operation and recording from a macro shall be available.

Q. Levels of user authorization for different functions shall be provided.

R. Remote software updates for the camera dome and the IP version shall be available.

S. Watch dog option shall cause a reboot when system is not responding.

T. Alarm report shall be able to run a response macro. External alarms shall be provided.

U. DHCP support shall be provided.

V. Definition of movement in a specific area (region-of-interest) from a workstation shall available.

W. Video motion detection shall be provided.

X. An embedded self-supported OS shall be provided.

Y. A smoked polycarbonate dome shall be included and all cameras provided must be vandal resistant with an IK10 rating.

Z. Approved Manufacturers:
   1. AXIS Communications - P3267-LVE

2.05 ACCESSORIES

A. Provide appropriate length patch cables to connect system components to the network equipment in telecommunications spaces. Patch Cables provided shall be channel approved or component certified to match the existing horizontal cabling channel category with a yellow jacket color. Coordinate channel manufacturer with the electrical contractor or section 27 1513 cabling contractor. Provide plenum rated jacket when when required by the 2023 National Electrical Code.

B. Provide appropriate length patch cables to connect the camera to the horizontal cabling at the camera locations. Patch Cables provided shall be channel approved or component certified to match the existing horizontal cabling channel category with a yellow jacket color. Coordinate channel manufacturer with the electrical contractor or section 27 1513 cabling contractor. Provide plenum rated jacket when when required by the 2017 National Electrical Code.

PART 3 INSTALLATION

3.01 INSTALLATION

A. All cameras are to be set to record on motion unless noted otherwise.

B. The contractor's commencement of equipment installation indicates acceptance of the telecommunications infrastructure and conditions.

C. No fiber optic cable shall be connected to a patch cable or other device without a prior inspection by an IEC 61300-3-35 compliant indirect microscope and obtain a passing test result.

D. The entire system shall be installed in a workmanlike manner and in accordance with approved manufacturers wiring diagrams. The Contractor shall furnish all conduit, wiring, and outlet boxes, relays transformers junction boxes, receptacles, cabinets and similar devices necessary for the complete installation. All wiring shall be type recommended by the manufacturer. Install head-end equipment in racks with all interconnecting wiring as required.

E. All penetration of floor slabs and firewalls shall fire stopped in accordance with all local fire codes.

F. All wiring shall meet the 2023 National Electrical Code standards. All camera system related patch cables shall be yellow in color and be channel approved.

G. The horizontal cabling provided will be terminated with 8P8C modular jacks mounted in surface mount boxes at the camera locations. Provide patch cables of the same color and category to connect to the horizontal cabling.

H. Field quality control: The system shall be installed and fully tested under the supervision of a trained manufacturer's representative. The system shall be demonstrated to perform all of the functions as specified.

I. Power requirements determined by actual equipment used.

J. Provide required power outlets, interconnecting cables, hardware and equipment for a complete and operable system.

K. Power is PoE only.

L. Each cable shall be individually home run from the device to the control room.

M. Install cameras in the general vicinity of locations indicated on Drawings at final locations defined by camera location test.

N. Wiring for all head end devices (matrix switcher, digital recorder, etc.) shall be Velcro strapped so that all connectors in a bundle can be removed and re-installed without the possibility of cross connecting.

O. All device mounting shall be of a mechanically secure permanent nature. Double-sided foam tape shall not be used to secure any terminal boxes, relay bases or circuit boards, etc.

P. All excess length AC cords are to be tied out of the way with Velcro straps (neutral color)

Q. Cable ties to be trimmed with flush-cut type pliers to avoid sharp edges (outdoor use only).

R. All rack-mounted equipment and blank panels are to be installed using the black nylon washers provided with the mounting screws.

S. Exposed wires that run to wall mounted cameras will be tie-wrapped (outdoor) or Velcro strapped (indoor) to the mount or fed through the tubing mount to present a neat appearance.

T. System time shall be synchronized with the Owner's designated NTP server(s).

3.02 TESTING

A. Provide demonstration of the system for the Owner and Architect/Engineer Technology Designer for the following:
   1. Count of installed cameras - verify video on each camera
   2. Ability to generate copies of video captured 15 days prior to test into file form and secure disk (with viewer application)
   3. Reception area audio & video monitoring demonstration.
   4. Demonstrate reception area audio file capture playback from 1 day and 15 days prior to test.

3.03 TRAINING

A. Training to be arranged with District personnel. 40 hours should be spread out over the length of the warranty.
   1. 8 hours at project turnover/completion, 8 hours at 3 months, 8 hours at 6 months, 8 hours at 1 year, 4 hours at 2 years, 4 hours at the 3 year point.

B. Refer to Submittal section of this Specification for training syllabus requirements.

C. Provide two (2) video copies of all training.

3.04 QUANTITY

A. Provide cameras as indicated on the Drawings and where noted in this Specification.

B. Provide outdoor cameras per technology Drawings.

END OF SECTION 28 23 00

SECTION 28 31 01
FIRE ALARM - DETECTION SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements are included as a part of this Section as though bound herein.

1.02 SUMMARY

A. Provide labor, material, equipment, and accessories necessary for a complete operable, electronically operated fire alarm system with emergency communication system as indicated on the Athletic Building Drawings and specified herein.

1.03 SUBMITTALS

A. Shop Drawings
   1. The system manufacturer's representative shall be responsible for furnishing 5 sets of engineering drawings matching the layout, scale, and sheet size of the contract documents. These drawings shall be assembled in a manor to satisfy the most recently adopted edition of the Ohio Building Code (OBC) concerning Fire Alarm Detection System Shop Drawings. These drawings shall indicate the interlocking of equipment external to the various control panels. These Drawings shall be included in the submittal to the Architect/Engineer for approval and shall be stamped/signed by a manufacturer's representative who is NICET Level III or IV certified and certified by the State of Ohio Board of Building Standards (OBBS) as a fire alarm system designer, or stamped by a Professional Engineer in the State of Ohio. The Owner will pay the drawing approval fees associated with the state plan approval of the fire alarm system. The Architect will be responsible for submitting the final fire alarm system shop drawings to the state for approval. The Contractor must submit this shop drawing information in a timely manner so as not to impede the project progress.
      a. The engineered drawings shall be stamped by the NICET certified designer or the PE of record for the fire alarm system.
      b. The Contractor shall provide additional documentation, certification, etc. as required to submit for fire alarm system plan approval.
      c. Fire alarm Drawings released with this set of specifications are for bidding purposes only. Devices are shown in the desired locations as coordinated with the building design, equipment, furniture, etc. The fire alarm system designer shall review the Drawings and notify the electrical engineer immediately if it is noticed that additional devices will be needed for code compliance.
   2. Complete and comprehensive shop drawings shall be submitted to the Architect/Engineer for review.

B. Post Construction
   1. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
   2. Operation & Maintenance Manuals
      a. Provide complete O & Ms. PDF format.
      b. PDF shall be fully indexed by Section Name/System/Device.
   3. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.04 QUALITY ASSURANCE

A. Units on the fire alarm system shall be listed by Underwriters Laboratories, Inc. for fire alarm use, and the control panel shall bear the UL label. The system shall be installed in accordance with requirements set by National Electric Code with particular attention to Article 760 and in compliance with applicable provisions of Standards No. 72 published by the National Fire Protection Association (NFPA), section 907 of the Ohio Building Code (OBC) and also with Local Code requirements.

B. All equipment must have transient protection to comply with UL864 requirements. Where fire alarm circuits leave the building, additional transient protection must be provided for each circuit.

1.05 CERTIFICATION

A. The Contractor shall provide the services and equipment of an alarm service company certified by NICET as being capable of furnishing the signaling systems specified herein. All components of the fire alarm system shall be U.L. listed.

B. The Contractor shall be certified by the system manufacturer for installation and programing with a minimum of five years experience with this system or similar fire alarm systems. All components of the fire alarm system shall be U.L. listed.

1.06 WARRANTY

A. Components, parts, and assemblies supplied by the manufacturer shall be guaranteed against defects in materials and workmanship in a period of 12 months, commencing upon system start up and beneficial use, at which time the system is protecting property of occupants, provided such defects are not caused by a misuse, abuse, neglect, unauthorized tampering, equipment modifications, or acts of God. Warranty services shall be provided by a qualified factory trained representative of the equipment manufacturer during normal working hours. The representative shall be based in a fully staffed branch office and located within a reasonable distance from the job site. An adequate supply of repair parts shall be maintained by the branch office. The manufacturer shall not be liable for consequential damages. The manufacturer's statement of warranty shall be included in the submittals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Simplex

B. Secutron

C. EST

D. Siemens

E. Notifier

F. Mircom

G. Potter

H. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE ALARM CONTROL PANEL

A. Provide a new analog/addressable Fire Alarm Control Panel (FACP), model number FX-353-LDR manufactured by Mircom, equals by Notifier NFS2-640, Simplex 4100ES and Secutron MR-2200, EST iO500, Siemens FC924. The FACP shall be capable of supporting up to 378 addressable points of any combination of addressable sensors or modules, equipped with a backlit LCD display, numerical keypad, and integrated UDACT/Digital Communicator. The digital communicator shall be able to be set for DACT or UDACT mode of operation. The FACP

shall be configurable via the front panel, PC, or remotely through a built-in modem. The control panel shall have an interface for connection of up to seven remote annunciators.

1. Sensors shall be configurable as alarm, verified alarm, latching or non-latching supervisory, monitor, and trouble.
2. Modules shall be capable to be configured as alarm, latching supervisory, non-latching supervisory, water flow, monitor, trouble, fire drill switch, signal silence switch, and aux disconnect.
3. Indicating circuits shall be configurable as silenceable or non-silenceable for both horns and strobes.
4. The control unit shall be capable of fire detection, equipment supervision and control, alarm management, and historical data collection and archiving.

B. Cellular Fire Alarm Communicator
   1. Provide a new cellular fire alarm communicator equal to Telguard TG-7FS model.
   2. The communicator may be used in Commercial Fire Alarm Systems as the sole (Cellular Transmission only), primary (Cellular Primary & Telco Backup), or secondary (Telco Primary & Cellular Backup) communication paths, via cellular network.
   3. Communicator is to be capable of working on Verizon's LTE Band or AT&T's Dual Band CDMA 1xRTT.
   4. Compliant with the 2016 Edition of NFPA 71.
   5. Meets UL 864 requirements for sole, primary, or backup path communications.
   6. Power
      a. Transmit Power: 200mW in all bands
      b. 60mA Standby
      c. 250mA Transmission
      d. Transformer - 12 VAC, 800mA, UL Listed - Plug In
      e. Minimum 7AH Battery
   7. Multiple Alarm Format Support
      a. Pulse Formats
         1) 3+1 pulse, 10pps, Double Round, 1400Hz ack
         2) 3+1 pulse, 20pps, Double Round, 2300Hz ack
         3) 3+1 pulse, 40pps, Double Round, 1400Hz ack
         4) 4+2 pulse, 20pps, Double Round, 1400Hz ack
         5) 4+2 pulse, 20pps, Double Round, 2300Hz ack
         6) 4+2 pulse, 40pps, Double Round, 2300Hz ack
      b. ContactId
      c. Modem IIe/IIIa2/4
      d. SIA2 (SIA-DC-03 level 2 release at 300 baud)
      e. Sonitrol
      f. DMP
   8. Complete Supervision of Communication Path(s)
      a. Line Fault Condition (LFC)
      b. No Service Condition (NSC)
      c. Radio Communications Failure Condition (RFC)
      d. Panel Presence Failure (PPF)
      e. Control Failure to Communicate (CFC)
   9. Complete Power Supervision
      a. Low/Missing Battery Condition (LBC)
      b. AC Failure Condition (ACFC)
      c. Dial Tone Failure (DTF)

d. Catastrophic Failure (CF)

10. Programmable Supervisory Trip Output Relays (STC), (2)
    a. STC1 - Normally Open
    b. STC2 - Normally Closed
    c. 1 or both STC relays shall be interfaced to main fire alarm panel to initiate abnormal trouble condition(s)
    d. The following supervisory features or combination of features are programmable to trip STC relays to meet a variety of installation requirements:
        1) Trips on AC fail condition (ACFC or Low Power Failure (LPF) if applicable)
        2) Trips on low or missing battery condition (LBC)
        3) Trips on no service condition (NSC)
    e. Trips on line fault condition (LFC)
        1) Trips on radio failure condition (RFC)
        2) Trips on dial tone failure (DTF)
    f. The following system trouble features or embedded in the communicator for tripping the STC relays and cannot be changed:
        1) Tripped when unit is not activated at the Telguard Communications Center (TCC)
        2) Trips on catastrophic failure (CF)
        3) Trips on deactivation command from the TCC
11. Radio Transceiver
    a. LTE Bands: 4 & 13 (Verizon)
    b. Dual Band CDMA 1xRTT (AT&T)
12. Physical Details
    a. 7.5" H x 11.5" W x 3.5" D Red Cabinet to house transceiver and battery
    b. Operating Environment: 32 to 122 degrees Fahrenheit, up to 95% Humidity
13. Accessories
    a. ACD12/ACD35/ACD50/ACD100: 12/35/50/100 Feet of Low Loss High Performance Cable
    b. HGDL-0/HGD-0 High Gain Directional Antenna or equal.
    c. EXDL-0/EXD-0 External Antenna or equal (if 2.5 RSSI is not obtained by unit mounted antenna).
    d. Provide and install necessary cable and antenna to ensure minimum 2.5 RSSI.

C. Provide dedicated 20 amp, 120 volt circuit for control panel power feed. This circuit shall be fed from the emergency generator power system when emergency generator power is available on site.
    1. Provide circuit breaker markings, locks, etc. to satisfy applicable codes and the local AHJ.

D. Provide panel with NAC extender modules as required to accommodate the number of NAC power supply units for a complete operating system.

E. The following components shall be supervised in the event of an open circuit and be identified by a yellow LED as to its faulty circuit, whether the trouble is in the alarm bell relay, device alarm, or alarm LED's.
    1. Provide necessary auxiliary contacts (alarm and trouble), for sending signals to the dialer system.
    2. Provide necessary auxiliary contacts to shut down the AH units and close the smoke doors as required. See Drawings for location on initiation devices.
    3. Control panel shall provide a telephone dialer actuation and supervisory circuit. A switch shall be provided to disconnect the fire alarm system from the telephone dialer. Actuation

of the disconnect switch or disconnecting the dialer phone line shall cause the system trouble signal to operate and a specific telephone dialer disconnect LED to annunciate.

4. Control panel shall have provisions for graphic remote zone annunciation.

2.03 NOTIFICATION APPLIANCE CIRCUIT (NAC) POWER SUPPLY UNITS

A. Provide NAC units as necessary per manufacturer for a complete operating system. Coordinate rough-in and power requirements for unit with Division 26 contractor. Division 26 contractor shall provide rough-ins and power per manufacturer's requirements.

1. Provide 20 amp, 120 volt circuit for power supply unit power feed. This circuit shall be fed from the emergency generator power system when emergency generator power is available on site. Provide circuit breaker markings, locks, etc. to satisfy applicable codes and the local AHJ.

2.04 SYSTEM DEVICES

A. Addressable Manual Fire Alarm Pull Station.

1. The pull station shall be dual action pull lever type, key resettable, have a permanently attached intelligent addressable module, and have a plastic breakrod. The pull station shall have a red, metal die-cast housing.
2. The pull station shall contain electronics that communicate the station's status to the FACP.

B. Addressable Thermal Fire Detector and base.

1. Combination rate-of rise and 135 degrees F fixed temperature
2. White polycarbonate housing.
3. Low profile, flanged, addressable mounting base with electronics to communicate the detector's status to the FACP.
   a. Thermal fire detectors used for direct control of other systems or devices (i.e. smoke dampers, door holds, elevators, shunt trip circuit breakers, etc.) shall have a mounting base equipped with an integral set of dry contacts, or an external intelligent addressable relay module may be used for control. Power through the relay to be coordinated with Division 26. Refer to E3 and E5 sheets for additional information.

C. Addressable Area Photo Electric Smoke Detector and base.

1. Intelligent photoelectric smoke sensor with LED which flashes when detector is polled and turns steady on when detector goes into alarm.
   a. Provide a remote LED indicator for smoke detectors mounted above ceilings in smoke dampers and the like. LED indicator shall be flush mounted in ceiling directly below smoke detectors. Provide a label for the remote LED to indicate its purpose.
2. White polycarbonate housing.
3. Low profile, flanged, addressable mounting base with electronics to communicate the detector's status to the FACP.
   a. Smoke detectors used for direct control of other systems or devices (i.e. smoke dampers, door holds, elevators, shunt trip circuit breakers, etc.) shall have a mounting base equipped with an integral set of dry contacts, or an external intelligent addressable relay module may be used for control. Power through the relay to be coordinated with Division 26. Refer to E3 and E5 sheets for additional information.

D. Addressable Duct Type Smoke Detector.

1. Air duct mounted photoelectric type smoke detector assemblies listed by UL and approved by Factory Mutual Research under the current standards for photoelectric type duct detectors. The duct detector assembly shall be addressable with electronics to communicate detector's status to the FACP.
2. Assembly shall operate at air velocities from 100 feet to 4000 feet per minute.

3. Provide sampling tubes based on size of ductwork. Coordinate exact size with ductwork in field.
4. Assembly shall have visual indication of alarm and power. Provide a remote LED indicator light, wall mounted and labeled, to indicate its purpose by each air handler unit VFD.
5. The duct type smoke detector shall be equipped with integral set of dry contacts, or an external intelligent addressable relay module may be used for control. Power through the relay to be coordinated with Division 26.

E. Addressable Carbon Monoxide Gas Detector
1. Intelligent CO sensor with LED which flashes when detector is polled and turns steady on when detector goes into alarm.
2. White polycarbonate housing.
3. Low profile, flanged, addressable mounting base with electronics to communicate the detector's status to the FACP.

F. Addressable Monitor Module.
1. Intelligent addressable module with electronics to communicate the module's status to the FACP.
2. LED to indicate module status.

G. Addressable Relay Module.
1. Intelligent addressable module with electronics to communicate the module's status to the FACP.
2. LED to indicate module status.
3. Two isolated sets of contacts to control desired functions.

H. Remote LED Alarm Indicator.
1. LED indicator light to connect to smoke detectors, duct detectors, etc. to show status of hidden or remote device.

I. Notfication Devices:
1. Wall Strobe
   a. Recessed synchronized strobe light with back box and trim, 24VDC, with light intensity of 110 candela, 225mA, flush mounted at 80 inches above finished floor or 6 inches below ceiling, whichever is lower.
   b. Color: Red
   c. Provide a sync module for notification devices.

J. Signal Devices:
1. Recessed combination synchronized strobe light with 4 inch electronic horn (or single synchronized strobe), with back box and trim, 24VDC, with light intensity of 110 candela, 225mA, flush mounted at 80 inches above finished floor or 6 inches below ceiling, whichever is lower.
   a. Wire circuits to a maximum of 80% capacity.
   b. Provide a sync module for signal devices.

K. Remote Annunciator.
1. Backlit LCD display to show system status.
2. Indicators for A.C. on, alarm, supervisory, trouble, and CPU fail.
3. Control switches for system reset, signal silence, fire drill, and acknowledge.
4. Numeric keypad to access menu functions.
5. Flush mounted.

2.05 SYSTEM WIRING

A. Provide in accordance with manufacturer's instructions, wiring (in conduit), and outlet boxes for the erection of a complete system as described herein and as shown on the Engineer's Drawings. Minimum wire size shall be No. 14, provide wiring per manufacturer's requirements.

B. Wiring shall be in accordance with requirements of the National Electrical Code and NFPA Regulation No. 72. The fire alarm, including components and wiring, shall be completely installed and wiring shall be properly tagged and color coded. The Contractor shall make final connections as shown and required by the equipment manufacturer's wiring instructions.

C. The manufacturer's authorized representative shall perform a quality inspection of the final installation, which shall be done in the presence of the Contractor and local Authority Having Jurisdiction (AHJ). The representative shall submit a certificate of completion to the contractor when work is satisfactorily completed.

2.06 SYSTEM PERFORMANCE REQUIREMENTS

A. The activation of any fire alarm station or automatic detector circuit shall automatically perform the following functions:
   1. All automatic programs assigned to the alarm point shall be executed and the associated indicating devices and relays activated.
   2. The System Alarm on appropriate panel will indicate an alert condition.
   3. Activate all control by event functions related to the alarm.
   4. The approved certified Central Monitoring Agency to be signaled automatically.
   5. Shut down individual HVAC units upon activation of local detectors.
   6. Sound a continuous alarm over all signals and activate the associated flashing light.
   7. Activation of the building fire alarm system shall automatically unlock access controlled egress doors and the doors shall remain unlocked until the fire alarm system has been reset.

B. Test - Fire Drill Mode
   1. Include with the system a "Fire Drill Mode". Upon activation of Fire Drill Mode, the annunciators and horns and strobes will activate. HVAC units will NOT be shut down, and the communicator will NOT dial out to the central monitoring agency. This will be a button activation at the main control panel, and there will be button deactivation at the main control panel.

C. Emergency Lock Down Monitoring.
   1. The system shall monitor the access control system and release all doors with hold opens upon activition of the emergency lock down function without activating notification devices.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install new manual stations, signals, wiring system, and power and automatic stations (ceiling smoke detectors, duct mounted smoke detectors, thermo detectors, and the like). Connect to new fire alarm system as required by system manufacturer.

B. Installations shall be in strict conformance with the manufacturer's recommendations.

C. For each smoke damper shown on the Drawings provide a smoke detector rated for the air velocity of the opening. Mount the smoke detector in the damper opening per the manufacturer's recommendations.
   1. Coordinate 120 volt power connections to smoke dampers with Division 26. Smoke detectors used for control of smoke dampers shall have an integral relay, or an external intelligent addressable relay module may be used for damper power control. Refer to E3 and E5 sheets for smoke damper locations.

D. Outlets shall be equipped with the appropriate fire alarm device.

E. Wiring shall be installed in conduit.

3.02 PROGRAMMING

A. Program the system using the Owner's final room number designations, not the Architect's room numbers as shown on the Drawings.

3.03 PARTIAL OR CONTINUED OCCUPANCY

A. Should the Owner elect to partially occupy or continuously occupy the building prior to Substantial Completion of all work, the fire alarm system for that portion of the building so occupied, including the assigned means of egress from same, shall be made fully operational. System status shall be certified in writing by the manufacturer and the Division 26 Contractor.

3.04 DEMONSTRATION/INSPECTION

A. The manufacturer's authorized representative shall perform a quality inspection of the final installation and in the presence of electrical contractor and Owner's representatives, shall perform a complete functional testing of this system. A system certification verifying the proper system operation shall be required prior to acceptance by the Owner.

B. Demonstrate entire system and proper function of each device.

C. Coordinate and assist the Owner with the requirements and set-up of system monitoring with the monitoring company of the Owner's preference.

3.05 TRAINING

A. Provide four (4) hours training for District's personnel on the operation, programming and maintenance of the system.

B. Provide two (2) video copies of all training.

END OF SECTION 28 31 01

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Installation of erosion and sedimentation control devices, per Storm Water Pollution Prevention Plans.

B. Clearing of existing vegetation.

C. Removal of existing debris.

1.02 RELATED REQUIREMENTS

A. Section 01 11 00 - Summary of Work: Limitations on Contractor's use of site and premises.

B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

D. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

E. Section 32 93 00 - Plants: Relocation of existing trees, shrubs, and other plants.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.04 PROJECT CONDITIONS

A. 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.

B. Comply with other requirements specified in Section 01 70 00.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 23 23 - Fill and Backfill

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 01 70 00.

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, and paving.

B. In areas where vegetation must be removed but no construction will occur, remove vegetation with minimum disturbance of the subsoil.

C. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
      a. Green wood is not to be used for mulch.
   2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
   5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
   6. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

D. Restoration:
   1. 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. This includes root damage due to poor protection fence or upkeep.
      a. Trees and vegetation will be considered dead when main leader has died back or when 25 percent or more of crown has died .
      b. Trees will be considered damaged and not able to reasonably survive when repeated neglect of protection is observed.
   2. If a tree is deemed damaged or dead by the owner's representative, a $500 per caliper inch of tree penalty will be assessed.

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 31 10 00

SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site.

C. Topsoil testing, amendment and Finish grading .

1.02 RELATED REQUIREMENTS

A. Document: Geotechnical Subsurface Investigation.

B. Section 31 10 00 - Site Clearing.

C. Section 31 23 16 - Excavation.

D. Section 31 23 23 - Fill: Filling and compaction.

E. Section 32 92 19 - Seeding: Finish ground cover.

F. Section 32 93 00 - Plants: Topsoil in beds

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 PROJECT CONDITIONS

A. Protect above- and below-grade utilities that remain.

B. Protect plants, lawns, and other features to remain as a portion of final landscaping.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from grading equipment and vehicular traffic.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: Topsoil excavated on-site or imported.
   1. Free of roots, gravel overages, rocks larger than 3/4 inch, subsoil, debris, large weeds and foreign matter.
   2. Soil shall have the following USDA particle size analysis. Sand, silt and clay shall be determined by ASTM D422
      a. Gravel: Plus 2mm. Less than 10%
      b. Sand: .05mm to .2mm. 15-40%
      c. Silt: .002 to .05mm. 25-65%
      d. Clay: minus .002mm. 20-35%

B. Other Fill Materials: See Section 31 23 23.

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.

C. Verify all SWPPP sedimentation controls are in place downslope prior to stripping topsoil.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Protect from damage above- and below-grade utilities to remain.

D. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

E. 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. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

C. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content.

D. When excavating through roots, perform work by hand and cut roots with sharp axe.

E. Grade areas adjacent to building to drain away from structures and to prevent ponding.

F. See Section 31 23 23 for filling procedures.

G. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

H. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.04 SOIL REMOVAL AND STOCKPILING

A. Stockpile topsoil to be re-used on site; reference civil drawings for location of remaining soil.

B. Stockpile subsoil to be re-used on site; reference civild drawings for location of remaining soil.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

D. Stockpiles:
   1. Stockpile without intermixing soil types
   2. Use areas designated on the site
      a. Stockpile soil material away from edges of excavations
      b. Do not place stockpiles within the drip line of trees to remain.
   3. Place, grade and shape stockpiles to drain surface water.
   4. Protect from erosion (wind and water). Stabilize with temporary vegetation or tarps.

3.05 GENERAL SURFACE GRADING

A. Uniformly grade areas within project limits including adjacent transition areas.
   1. Smooth finish surface within specified tolerances, grade in uniform levels or slopes between points where elevations are shown and between points and existing grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

3.06 FINISH GRADING

A. Before Finish Grading:
   1. Verify trench backfilling has been inspected.
   2. Verify subgrade has been contoured and compacted.
   3. Verify topsoil amendments have been added and thoroughly mixed in.

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 a minimum depth of 6 inches.

E. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

F. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

4.01 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: Contractor must utilize a properly calibrated conical laser for machine-controlled laser-grading equipment to meet an elevation tolerance of +/-3/8" within 25' in any direction of the proposed finish grade.

4.02 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

4.03 FIELD QUALITY CONTROL

A. See Section 31 23 23 for compaction density testing.

4.04 CLEANING

A. Remove unused stockpiled topsoil and subsoil. Grade area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION 31 22 00

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, slabs-on-grade, paving, and dewatering.

B. Trenching for utilities outside the building to utility main connections.

C. Dewatering

1.02 RELATED REQUIREMENTS

A. Document: Geotechnical Subsurface Investigation; bore hole locations and findings of subsurface materials.

B. Section 01 4000 - Quality Requirements

C. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.

D. Section 31 22 00 - Grading: Grading.

E. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

F. Section 31 23 23 - Fill: Fill materials, backfilling, and compacting.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.04 DEFINITIONS

A. Excavation: Removal of material encountered required for building volume below grade, footings, slab-on-grade, paving, utility trenches, etc.

B. Additional Excavation: Excavation below required excavation as directed by the Architect. Additional excavation and replacement material will be paid for according to the Contract provisions for changes in the work.

C. Unauthorized Excavation: Excavation below required excavation or beyond required excavation without direction of the Architect. Unauthorized excavation and remedial work directed by the Architect shall be without additional compensation.

1.05 QUALITY ASSURANCE

A. Code and Standards: Perform work complying with requirements of authorities having jurisdiction

B. Testing and Inspection: A qualified independent geotechnical engineering testing agency shall classify proposed on-site borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.

1.06 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Protect plants, lawns, and other features to remain.

C. Protect bench marks, survey control points, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bedding and Fill to Correct Over-Excavation:

1. See Section 31 23 23 for bedding and corrective fill materials at general excavations.
2. See Section 31 23 16.13 for bedding and corrective fill materials at utility trenches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 10 00 for clearing, grubbing, and removal of existing debris.

C. See Section 31 22 00 for topsoil removal.

D. Protect utilities that remain and protect from damage.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Owner's Representative.

3.03 DEWATERING

A. Prevent surface water and ground water from entering excavations and from flooding project site and surrounding area.

B. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings and soil changes detrimental to stability of subgrades and foundations.
   1. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering systems necessary to convey water away from excavations.

3.04 EXCAVATING

A. General
   1. Explosives: Do not use explosives
   2. Underpin adjacent structures that could be damaged by excavating work.
   3. Excavate to accommodate new structures and construction operations.
   4. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
   5. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.
   6. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
   7. Do not interfere with 45 degree bearing splay of foundations.
   8. Cut utility trenches wide enough to allow inspection of installed utilities.
   9. Hand trim excavations. Remove loose matter.
   10. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23.
   11. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.
   12. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect. If the proposed excavation extends more than 1 foot into the excavation, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by the Geotechnical Engineer.
   13. Remove excavated material that is unsuitable for re-use from site.

14. Stockpile excavated material to be re-used in area designated on site 31 22 00.
15. Remove excess excavated material from site.
16. Refer to the geotechnical report for additional recommendations.

B. Excavation for structures:
   1. Excavate to indicated elevations and dimensions within a tolerance of plus or minus one (1) inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction.
      a. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave a solid base to receive other work.

C. Excavation for walks and pavements:
   1. Excavate surfaces under walks and pavements to indicated cross sections, elevations and grades.

D. Excavation for trenches:
   1. Cut utility trenches wide enough to allow inspection of installed utilities.
   2. Excavate trenches to indicated gradients, lines, depths and elevations. Beyond building perimeter keep bottoms of trenches sufficiently below grade to avoid freezing.
   3. Excavate trenches to uniform width to provide working clearance on each side of pipe or conduit. Provide 12 inches clearance on each side
   4. If bedding course is not called for, excavated and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints and barrels of pipes and for joints, fittings and bodies of conduits. Remove stones and sharp objects to avoid point loading.
      a. For pipe and conduits less than 6 inches in nominal diameter and flat bottom multi-duct conduit lines excavate to indicated depths and support pipe and conduit on an undisturbed subgrade.

3.05 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces by Owner's Representative before placement of foundations.

3.06 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

F. Repair and re-establish grades to specified tolerances where completed surfaces become eroded, rutted, settled or lose compaction due to subsequent construction operations or weather conditions.

END OF SECTION 31 23 16

SECTION 31 23 23
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, and site structures.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Proof rolling of building areas, drives and parking areas.

1.02 RELATED REQUIREMENTS

A. Document: Geotechnical Subsurface Investigation; bore hole locations and findings of subsurface materials.

B. Section 01 4000 - Quality Requirements

C. Section 02 4100 - Demolitions

D. Section 31 22 00 - Grading: Removal and handling of soil to be re-used.

E. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.

F. Section 32 1123 - Aggregate Base and Surfacing

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: The uppermost surface of an excavation, the top of surface of a fill or backfill, immediately below subbase, drainage fill, or topsoil materials.

C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

D. Bedding Course: Layer placed over excavated subgrade in a trench before laying pipe.

1.04 REFERENCE STANDARDS

A. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2025.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.

D. 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).

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Compaction Density Test Reports.

1.06 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 designated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.

2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Recyclable Fill: Concrete and masonry products from on site demolition:
   1. Concrete and masonry products to be clean of deleterious materials, including but not limited to metals, and plastics.
   2. Concrete and masonry products crushed into units no larger than 3 inches in size.
   3. Recyclable material subject to the approval by representative of the soils testing agency.

B. General Fill: Subsoil excavated on-site and imported if required.
   1. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   2. Excavated material subject to the approval by representative of the soils testing agency.

C. Structural Fill: Subsoil excavated on-site imported if required
   1. Fill to not contain more than 3 percent by weight of organic matter, waste construction debris, or other deleterious materials.
   2. Non-expansive materials must be used.
   3. Standard Proctor Maximum Density Greater than 100 pounds per cubic foot and Atterburg Liquid Limit less than 40, and a plasticity index of less than 20.
   4. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   5. Excavated material subject to the approval by representative of the soils testing agency.

D. Engineered Fill: Subsoil excavated on-site and imported borrow if required.
   1. Silty-clayey soils or bankrun sand and gravel
   2. Fill to not contain more than 3 percent by weight of organic matter, waste construction debris, or other deleterious materials.
   3. Non-expansive materials must be used.
   4. Standard Proctor Maximum Density Greater than 100 pounds per cubic foot and Atterburg Liquid Limit less than 40, and a plasticity index of less than 20.
   5. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   6. Excavated material subject to the approval by representative of the soils testing agency.

E. Concrete for Fill: Lean concrete.
   1. Ready-mixed concrete
   2. Compressive strength 1500 psi at 28 days

F. Flowable Fill:
   1. Mix design shall have an unconfined compressive strength according to ASTM D4832.
   2. Mix design shall generally conform to the following:
      a. Type 1 for pipe trench backfill
         1) Cement: 50 lbs/cu yd
         2) Fly Ash: 250 lbs/cu yd
         3) Fine Aggregate: 2910 lbs/cu yd
         4) Water: 500 lbs/cu yd
         5) Entrained Air: 0%
      b. Type 2 for backfill under structures
         1) Cement: 50 - 100 lbs/cu yd
         2) Fly Ash: 0 lbs/cu yd
         3) Fine Aggregate: 2420 lbs/cu yd
         4) Water: 210-300 lbs/cu yd
         5) Entrained Air: 5% plus or minus 1 1/2 %

3. Mixes shall conform to the requirements of ACI 229 for Controlled Low Strength Material.
4. Mixes shall be flowable.
5. Flowable fill shall be ready-mixed concrete.

G. Granular Fill - Gravel : Angular crushed washed stone; free of shale, clay, friable material and debris.
1. Graded in accordance with ASTM C136/C136M, within the following limits:
a. 2 inch sieve: 100 percent passing.
b. No. 200: 5 to 10 percent passing.

H. Drainage Fill:
1. # 56 or # 57 in accordance with the Ohio Department of Transportation Construction and Material Specifications
2. Drainage fill shall be clean and washed gravel

I. Sand: Conforming in accordance with Ohio Department of Transportation Construction and Material Specifications

J. Topsoil: See Section 31 22 00.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for general requirements for testing and analysis of soil material.

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. Identify required lines, levels, contours, and datum locations.

B. See Section 31 22 00 for additional requirements.

C. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

D. Verify structural ability of unsupported walls to support imposed loads by the fill.

E. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. After topsoil has been stripped proof roll areas to be occupied by the new building, paved surfaces and site improvements using a medium weight roller. A representative of the soils testing agency shall be present during proof rolling.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 DEWATERING

A. Prevent surface water and ground water from entering excavations and from flooding project site and surrounding area.

B. Protect subgrade from softening, washout, undermining and damage.
1. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering systems necessary to convey water away from excavations.

3.04 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Fill placement shall extend beyond the limits of the proposed building and paved areas a minimum horizontal distance equal to the height of fill or 5 feet whichever is greater.

D. Employ a placement method that does not disturb or damage other work.

E. Maintain optimum moisture content of fill materials to attain required compaction density.
   1. Moisture reduction options:
      a. Disking and drying soil.
      b. Addition of lime or by-product lime modification. Modification procedure to follow the guidelines of ODOT Item 205 using a lime by-product or similar material capable of reducing the moisture content of moist soils. Testing agency to evaluate compatibility of materials and modification procedures.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 8 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 100 percent of maximum dry density.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.
   2. At load bearing foundations: 100 percent of maximum dry density.
   3. At other locations: 90 percent of maximum dry density.

K. Reshape and re-compact fills subjected to vehicular traffic.

L. 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.

3.05 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Under load bearing footings and foundations
   1. Use Engineered Fill or Structural Fill
   2. Fill up to subgrade elevations.
   3. Maximum depth per lift: 8 inches, compacted.
   4. Compact to minimum 100 percent of maximum dry density.

C. Under Interior Slabs-On-Grade:
   1. Use Engineered Fill or Structural up to 4 inches below concrete slab
   2. Maximum depth per lift: 8 inches compacted.
   3. Use Drainage Fill.
   4. Depth: 4 inches deep.
   5. Compact to 97 percent of maximum dry density.
   6. See Section 03 3000 for placement of Vapor Barrier

D. At Foundation Walls:
   1. Use general fill.
   2. Fill up to subgrade elevation.
   3. Maximum depth per lift: 8 inches compacted.
   4. Compact each lift to 95 percent of maximum dry density.
   5. Do not backfill against unsupported foundation walls.
   6. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

E. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches:
   1. Bedding: Use sand or Drainage Fill or as noted on drawings.
   2. Haunching: Use sand fill. Haunching fill up to spring line of pipe
   3. Initial Backfill: Use granular fill. Initial backfill up to 12 inches above the pipe
   4. Cover with:
      a. Exterior lawn areas: General Fill
      b. Within building area: Granular Fill
      c. Within building area where trench is within 18 inches of column or footing and below bottom of footing:
         1) Wrap pipe with one inch of fiberglass blanket and Concrete Fill or Flowable to bottom of footing
         2) Above Concrete Fill: Granular Fill or Flowable Fill
      d. Under paving and walks: Granular Fill or Flowable Fill
   5. Fill up to subgrade elevation.
   6. Compact in maximum 6 inch lifts to 95 percent of maximum dry density.

F. Below aggregate base of asphalt drives, parking areas:
   1. Use Engineered Fill or Structural Fill up to bottom of aggregate base as specified in Section - 32 1123
   2. Maximum depth per lift: 6 inches of loose material.
   3. Compact each lift to 100 percent of Standard proctor maximum dry density as determined by ASTM Designation D698.

G. Under Portland Cement Concrete Paving:
   1. Use Engineered Fill or Structural Fill up to bottom of Drainage fill.
      a. Maximum depth per lift: 6 inches of loose material.
      b. Compact each lift to 100 percent of Standard proctor maximum dry density as determined by ASTM Designation D698.
   2. Place 4 inches of Drainage Fill or 304 as shown on drawings.
      a. Compact to 100 percent of Standard proctor maximum dry density as determined by ASTM Designation D698.

H. At Lawn Areas:
   1. Use general fill.
   2. Fill up to 6 inches below finish grade elevations.
   3. Compact to 95 percent of maximum dry density.
   4. See Section 31 22 00 for topsoil placement.

3.06 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.

3.07 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, AASHTO T 180, or AASHTO T 180.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Proof roll compacted fill at surfaces that will be under slabs-on-grade and paving.

3.08 PROTECTION

A. Protected newly filled areas from traffic, freezing and erosion. Keep free of trash and debris.

B. Repair and re-establish filled areas to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or loses compaction due to subsequent construction operations or weather conditions.

1. Remove and replace material to depth directed by the Architect, reshape and recompact at optimum moisture content to the required density.

C. Settling: Where settling occurs during the project warranty period, remove finish surface, backfill with additional approved material compact and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work and eliminate the evidence of restoration to the greatest extent possible.

3.09 CLEANING

A. See Section 01 74 19 - 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 31 23 23

SECTION 32 11 23
AGGREGATE BASE AND SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Aggregate Surfacing

1.02 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Preparation of site for base course.

B. Section 31 23 23 - Fill: Compacted fill under base course.

C. Section 32 12 16 - Asphalt Paving: Finish and binder asphalt courses.

D. Section 32 13 13 - Concrete Paving: Finish concrete surface course.

1.03 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 1965 (2004).

B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.

C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

D. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.

E. 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.

F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

H. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on geosynthetic fabric

C. Materials Sources: Submit name of imported materials source.

D. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.05 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.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate: Coarse aggregate, conforming to Ohio Department of Transportation (ODOT) Construction and Material Specifications, Item 304

B. AASHTO #57 Stone: Open-graded, self-compacting (angular) aggregate blend of size 5, 6 & 7 stone, graded in accordance with the following limits:
   1. 1 1/2" screen: 100% passing
   2. 1" screen: 95-100% passing
   3. 1/2" screen: 25-80% passing
   4. screen #4: 0-10% passing
   5. screen #8: 0-5% passing

C. Fine Aggregate: Sand; complying with State of Ohio Highway Department standard.

D. Use of Reclaimed Base:
   1. Contractor may use a blend of new material in combination with reclaimed aggregate material.
   2. Material subject to the approval by representative of the testing agency.

E. Recyclable Aggregate: Concrete and masonry products from on site demolition:
   1. Remove reinforcing and separate to salvaged metals.
   2. Remove brick and clay masonry.
   3. Crush concrete and masonry waste to less than 1 1/2 inch in each direction.
   4. Crush concrete and masonry waste with at least four (4) parts of specified aggregate for each part of concrete waste.
   5. Material subject to the approval by representative of the testing agency.

F. Concrete Waste Disposal as Aggregate Material: Dispose of clean hardened concrete waste by crushing and mixing with aggregate as aggregate is placed.
   1. Remove reinforcing and separate to salvaged metals
   2. Crush concrete waste to less than 1 1/2 inch in each direction.
   3. Crush concrete waste with at least four (4) parts of specified aggregate for each part of concrete waste.
   4. Material subject to the approval by representative of the testing agency.

G. Masonry Disposal as Aggregate Material: Dispose of clean concrete masonry waste by crushing and mixing with aggregate as aggregate is placed. Comply with the requirements of the testing agency.
   1. Remove reinforcing and separate to salvaged metals.
   2. Remove brick and clay masonry.
   3. Crush concrete masonry waste to less than 1 1/2 inch in each direction.
   4. Crush concrete masonry waste with at least four (4) parts of specified aggregate for each part of concrete waste.
   5. Material subject to the approval by representative of the testing agency.

H. Filter Fabric:
   1. Professional Grade 100% spunbonded polypropylene with UV inhibitors
   2. Manufacturer:
      a. Product: Typar Professional Landscape Fabric by Reemay Inc. www.typarlandscape.com
      b. Other Acceptable Manufacturers:
         1) B.11 Groundcover Fabric by US Global Resources, Seattle WA. www.usgr.com

2) Gintec Black Groundcover by Gintec Shade Technologies Inc., www.gintec-shade.com
3) Substitutions: See Section 01 6000 - Product Requirements.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

B. 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. Under Bituminous Concrete Paving:
1. Place course aggregate to a compacted thickness as noted on drawings.
2. Compact to 95 percent of maximum dry density.

B. Under Portland Cement Concrete Paving:
1. Place course aggregate to a compacted thickness as noted on drawings.
2. Compact to 95 percent of maximum dry density.

C. Aggregate Surfacing:
1. Place filter fabric on subsoil
2. Place coarse aggregate to a total compacted thickness of 6 inches unless noted otherwise.
3. Compact to 95 percent of maximum dry density.

D. Place aggregate in maximum 6 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. See Section 01 43 00 - Quality Assurance, for general requirements for field inspection and testing.

B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.

C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor"), or ASTM D1557 ("modified Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: each lift.

F. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade and 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 32 11 23

SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cold milling of existing asphalt

B. Multiple course bituminous concrete paving.

C. Surface sealer.

D. Striping and Associated Markings.

1.02 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Preparation of site for paving and base.

B. Section 31 23 23 - Fill: Compacted subgrade for paving.

C. Section 32 11 23 - AGGREGATE BASE AND SURFACING: Aggregate base course.

1.03 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 1965 (2004).

B. Ohio Department of Transportation, Construction and Material Specifications

C. AI MS-2 - Asphalt Mix Design Methods; 2015.

D. AI MS-19 - A Basic Asphalt Emulsion Manual; Fourth Edition.

E. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.

F. ASTM D3549 -03 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Speciments

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Certificates: Material certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

C. Product Data: Manufacturer's data sheets on striping paint product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with Ohio Department of Transportation (ODOT) Construction and Material Specifications.

B. Mixing Plant: Complying with ODOT.

C. Obtain materials from same source throughout.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for paving work on public property.

1.07 FIELD CONDITIONS

A. Do not apply asphalt materials if subgrade is wet or excessively damp.

B. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

C. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate for Intermediate Course: Ohio Department of Transportation (ODOT) Construction and Material Specifications Item 441 Type 2
   1. Use of ODOT certified Reclaimed Pavement:
      a. Contractor may use a blend of new material in combination with reclaimed asphalt concrete pavement or reclaimed bituminous aggregate base pavement obtained from the job site.
      b. A maximum of 25 percent of reclaimed pavement may be used without adjusting the Job Mix Formula.

B. Aggregate for Surface Course: Ohio Department of Transportation (ODOT) Construction and Material Specifications Item 441 Type 1.
   1. Use of ODOT certified Reclaimed Pavement:
      a. Contractor may use a blend of new material in combination with reclaimed asphalt concrete pavement or reclaimed bituminous aggregate base pavement obtained from the job site.
      b. A maximum of 25 percent of reclaimed pavement may be used without adjusting the Job Mix Formula.

C. Fine Aggregate: Ohio Department of Transportation (ODOT) Construction and Material Specificatoins.

D. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.

E. Tack Coat: Homogeneous, medium curing, liquid asphalt.
   1. Homogeneous, medium curing, liquid asphalt, complying withe ASTM D 977 or ASTM 2397
   2. ODOT Item 408 bituminous prime coat at 0.04 gallon per square yard.

F. Striping Paint: Fast drying water based, 100 percent acrylic type. (ODOT 740.02, Type 1A)
   1. Color:
      a. White for Parking Lines.
      b. White for Text of designated parking.
      c. Yellow for Bus Parking lines.
      d. White for Handicap parking spaces, aisles and symbols.
   2. Manufacturers:
      a. Sherwin Williams: Hotline Fast Dry Latex Traffic Marking Paint.
      b. Ennis-Flint: EF Series, Fast Dry
      c. Substitutions: See Section 01 6000 - Product Requirements

G. Seal Coat:
   1. Coal tar emulsion with sand additive for the seal coat and apply two coats.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Use dry material to avoid foaming. Mix uniformly.

B. Submit proposed mix design of each class of mix for review prior to beginning of work.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance to Ohio Department of Transportation (ODOT) Construction and Material Specifications.

3.02 EXAMINATION

A. Verify that compacted subgrade and granular base is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Proof roll prepared granular base to check for unstable areas and areas requiring additional compaction.
   1. Notify the Owner's Representative prior to start of work of unacceptable base conditions.
   2. Notify the Construction Manager prior to start of work of unacceptable base conditions.
   3. Start of work indicates acceptance of base

3.03 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

B. Mill to a nominal depth of 2 inches.

C. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.

D. Control rate of milling to prevent tearing of existing asphalt course.

E. Repair or replace curbs, manholes, and other construction damaged during cold milling.

F. Excavate and trim unbound-aggregate base course

G. Reclaimed Pavement:
   1. Contractor may use a blend of new material in combination with reclaimed asphalt pavement obtained from the job site.

3.04 CRACK TREATMENT:

A. Cracks less than 1/8 inch wide require no special treatment.

B. Cracks 1/8 to 3/8 inch wide to be filled with crack sealant so tack coat cannot seep into cracks

C. Cracks larger than 3/8 inch wide to be filled with emulsion slurry or commercial crack filler and allow to cure completely.

3.05 PATCHING

A. Saw cut perimeter of patch and excavate existing pavement section to sound base.

B. Excavate rectangular or trapezoidal patches extending 12 inches into adjacent sound pavement, unless otherwise indicated.

C. Cut excavation faces vertically.

D. Remove excavated material.

E. Recompact existing unbounded-aggregate base course to form new subgrade.

3.06 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat to contact surfaces of curbs, gutters and other surfaces.

C. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.07 PLACING ASPHALT PAVEMENT - MULTIPLE COURSES

A. Place asphalt intermediate course within 24 hours of applying primer or tack coat.

B. Place Surface course within 24 hours of placing and compacting Intermediate course.

C. Install gutter drainage grilles and frames in correct position and elevation.

D. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.

E. Compact pavement in accordance with Ohio Department of Transportation (ODOT) Construction and Materials Specifications. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

3.08 PLACING SEALER

A. Surface Preparation. Surface shall be cleaned by sweeping, blowing, or other methods until all dust, mud, clay lumps, vegetation, and foreign material are removed entirely from the pavement. Care shall be exercised to prevent material to be removed from becoming mixed with the new surface.

B. Crack Treatment:
   1. Cracks less than 1/8 inch wide require no special treatment.
   2. Cracks 1/8 to 3/8 inch wide to be filled with crack sealant so seal coat cannot seep into cracks
   3. Cracks larger than 3/8 inch wide to be filled with sand topped with emulsion slurry or commercial crack filler and allow to cure completely.

C. Seal Coat:
   1. First Coat: The seal coat shall be applied using a calibrated distributor truck spray bar and squeegee. Hand spraying, squeegee and brush application may be used in location where distributor truck cannot reach.
   2. Second Coat: The seal coat shall be applied using a calibrated distributor truck spray bar. Hand spraying, squeegee and brush application may be used in location where distributor truck cannot reach.
   3. Application rate shall be a minimum of 0.28 gallons per square yard per coat.

3.09 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
   1. Pavement sections which puddle water (birdbath) will not be acceptable. These sections will be removed and replaced and the entire area will be sealed to conceal patch.

B. Variation from true Elevation: Within 1/4 inch.

C. Compacted Thickness: Per table X1.1 in ASTM D3549-03, based on per layer compacted thickness.

3.10 STRIPING AND ASSOCIATED MARKINGS

A. Examination
   1. Do not begin installation until substrates have been properly prepared.
   2. Allow new pavement surfaces to cure before application of marking materials.
   3. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   4. Clean surfaces thoroughly prior to installation.

a. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.

5. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

B. Installation

1. Allow new pavement surfaces to cure for a minimum of 14 days before application of pavement paint. Clean the surface prior to painting. Ensure the surface is dry prior to painting.
2. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
3. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
4. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.
   a. Apply paint in one coat only.
   b. Wet Film Thickness: 0.015 inch, minimum.
   c. Width Tolerance: Plus or minus 1/8 inch.
5. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
   a. Mark the International Handicapped Symbol at indicated parking spaces.
   b. Hand application by pneumatic spray is acceptable.
6. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

C. Drying, Protection, and Replacement

1. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.
2. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.
3. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.
4. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

3.11 FIELD QUALITY CONTROL

A. See Section 01 43 00 - Quality Assurance, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with the following.

1. Thickness: In place compacted thickness of hot-mix asphalt course to be determined according to ASTM D 3549.
2. Surface Smoothness: Finished surface of each hot mix asphalt course will be tested for compliance with smoothness tolerances.
3. In-place Density:
   a. The right is reserved by the Owner/Architect to invoke the following material testing procedure when he deems necessary during and after pavement installation.
   b. Testing agency to take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.
      1) Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site,

prepare according to ASTM D 2041, and compact according to job-mix specifications.

2) In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
   (a) One core sample will be taken for every 1000 square feet of less of installed pavement with no fewer than 3 cores taken.
   (b) Field density of in place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlates with ASTM D 1188 or ASTM D 1726.

C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.12 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 5 days or until surface temperature is less than 140 degrees F.

B. Remove debris, junk, and trash from site.

END OF SECTION 32 12 16

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete paving, sidewalks, integral curbs, and barrier curbs.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 31 22 00 - Grading.

C. Section 31 23 23 - Fill.

D. Section 32 11 23 - Aggregate Base Courses.

E. Section 32 12 16 - Asphalt Paving wearing course.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

D. ACI 305R - Hot Weather Concreting; 2010.

E. ACI 306R - Cold Weather Concreting; 2010.

F. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

G. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.

H. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

J. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on joint filler, admixtures, and curing compound.

C. Product Data: Manufacturer's data sheets on striping paint product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain cementitious materials from same source throughout.

C. Follow recommendations of ACI 305R when concreting during hot weather.

D. Follow recommendations of ACI 306R when concreting during cold weather.

E. Installer Qualifications: Installer with minimum three years experience in similar projects.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI 301.

B. Pedestrian Concrete: 4,000 psi 28 day concrete, 5 inches thick. light broom finish.

2.02 FORM MATERIALS

A. Form Materials: As specified in Section 03 10 00, comply with ACI 301.

B. Joint Filler: Preformed; sponge rubber or cork (ASTM D1752).
   1. Thickness: 1/2 inch.

2.03 CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.

B. Cement: ASTM C 150, Type I - Normal portland type, grey color.
   1. Acquire all cement for entire project from same source.

C. Supplementary Cementitious Materials:
   1. Fly Ash: ASTM C618, Type C or F may be used up to a maximum of 25% of the total cementitious materials content in all concrete mixes, unless otherwise noted.
   2. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120 maybe used up to a maximum of 35% of the total cementitious material content in all concrete mixes, unless otherwise noted.
   3. The exact percentages shall be used on a successful test placement on the project site

D. Fine and Coarse Aggregates:
   1. ASTM C33, Class 3S, normal weight aggregates, uniformly graded, non-exceeding 1-1/2 inch nominal size.
   2. ASTM C330, light weight aggregates.
   3. Combined aggregate gradation for slabs shall be 8%-18% for large top size aggregate (1 1/2") or 8 - 22% for smaller top size aggregates (1" of 3/4") retained on each sieve below the top size and above the No. 100.
   4. Aggregate Supply: Provide aggregate from one source of supply to maintain uniformity of color size and shape.

E. Water: Clean and not detrimental to concrete.
   1. ASTM C94

F. Air-Entraining Admixtures: ASTM C260/C260M.
   1. Acceptable Manufacturers:
      a. Air-Mix or Perma-Air, Euclid Chemical.
      b. Sealtight AEA WR Meadows, Inc.
      c. Darex AEA or Daravair, WR Grace Company.
      d. Axim Italcmenti Group.
      e. Promix.
      f. Substitutions: See Section 01 60 00 - Product Requirements.

G. Chemical Admixtures: ASTM C494/C494M, Type A - Water Reducing.
   1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.04 ACCESSORIES

A. Curing Compound: ASTM C 309, Type 1, Class A.
   1. Clear waterborne membrane-forming curing compound.
      a. Day Chem Rez Cure: Dayton Superior Corporation
      b. Diamond Clear Vox: Euclid Chemical Co.
      c. Safe-Cure Clear; Chem Masters

B. Bonding Compound: Polyvinyl acetate or acrylic base complying with ASTM C 1059, type II.

C. Epoxy Adhesive: ASTM C881

2.05 CONCRETE MIX DESIGN

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

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures:
   1. Use of admixtures: Admixtures, except air entraining mixture, are not allowed except with permission of Architect.
   2. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus 1 - 1/2 percent with the following limits:
      a. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure(all above grade):
         1) 6.0 percent(severe exposure) 3/4 inch max. aggregate
         2) Other concrete (not exposed to freezing, thawing, or hydraulic pressure or to receive a surface hardener: 2 percent to 4 percent air
   3. NO calcium chloride will be permitted.

D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

E. Normal Weight Concrete:
   1. Compressive Strength, per ASTM C 39 at 28 days: As scheduled.
   2. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
      a. Subjected to deicer/watertight and freezing and thawing: W/C 0.45.
      b. Subjected to brackish water, salt spray, or deicer: W/C 0.40
   3. Slump Limits: Proportion and mixes to result in concrete slump a point of placement as follows:
      a. Slump limit for concrete containing high-range water reducing admixture (superplasticizers): Not more than 8 inches after adding admixture to site-verified 2 to 3 inch slump concrete.
      b. Ramps, slabs and sloping surfaces: Not more than 4 inches.
      c. Reinforced foundation systems: Not less than 1 inch and not more than 4 inches.
      d. Other concrete: Not less than 1 inch, not more than 4 inches.

2.06 MIXING

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

1. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1 1/2 hour to 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.
2. Use set retarding admixtures during hot weather only when approved by Owner's Representative.

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 SUBBASE

A. See Section 32 11 23 for construction of base course for work of this Section.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.

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 PLACING CONCRETE

A. Before placing concrete, inspect, and complete formwork installation, reinforcing steel, and install items to be embedded or cast in. Notify other trades to permit installation of their work.
   1. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

B. Moisten subbase to provide a uniform dampened condition at the time concrete is placed.

C. Place concrete in accordance with ACI 304R.

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.

E. Consolidate concrete by mechanical vibrating equipment supplemented by rodding or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.

3.06 JOINTS

A. General: Construct contraction, construction and isolation joints true to line with faces perpendicular to surface plan of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.
   1. Align curb, gutter, and sidewalk joints.
   2. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise

B. Construction Joint: Set construction joints at side and end termination of paving at locations where paving operations are stopped unless paving terminates at isolation joints.
   1. Continue reinforcement across construction joints unless otherwise indicated.

C. Expansion Joints:

1. Place 1/2 inch wide expansion joints at 30 foot intervals unless otherwise indicated on drawings and to separate paving from vertical surfaces and other components and in pattern indicated.
2. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required lace or clip joint filler sections together.
4. Secure to resist movement by wet concrete.

D. Contraction Joints: Provide weakened-plane contraction joints, section concrete into areas as shown on Drawings. Construct contraction joints for a depth of 1/4 of the concrete thickness.
1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with radiused jointer tool.
2. Provide joints at five (5) feet intervals if not indicated on pl.

3.07 FINISHING

A. Nonslip Broom Finish (Ns-Brm-FN): Apply nonslip broom finish to exterior concrete platforms, steps, walks, curbs, gutters and ramps.
1. Immediately after float finishing, slightly roughen concrete by brooming with fiber bristle broom, perpendicular to main traffic route unless otherwise indicated on drawing.

B. Area Paving: Light broom, texture perpendicular to pavement direction unless otherwise indicated on drawings.

C. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius unless otherwise indicated on drawing.

D. Curbs and Gutters: Light broom, texture parallel to pavement direction.

E. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.08 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 43 00 - Quality Assurance.

B. The owner will employ services of an independent testing agency to perform specified testing and inspections

C. Provide free access to concrete operations at project site and cooperate with appointed firm.

D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

E. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

F. Compressive Strength Tests: ASTM C 39. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 50 cu yd or less of each class of concrete placed in a day or for each 3000 square feet of surface area placed..
1. Cure specimens on job site under same conditions at concrete it represents
2. Test one specimen at 7 days
3. Test one specimen at 28 days
4. Retain one specimen in reserve for later testing if required.

G. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

H. Slump: ASTM C 143, one test for each concrete load at point of discharge, and one for each set of compressive strength test specimens.

3.10 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Owner's Representative and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Owner's Representative. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 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 32 13 13

SECTION 32 92 19
SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Confirmation and evaluation of topsoil and grading by others.

B. Finish grading of topsoil

C. Seeding, mulching and fertilizer.

D. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Topsoil material.

1.03 DEFINITIONS

A. Weeds: Include, but not limited to, Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene two weeks before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Seed Certification: Contractor to provide documentation that seed is blue tag certified or contains blue tag varieties. Indicate minimum purity and germination rates for each.

C. Seeding Schedule: Indicate dates for proposed seeding and existing lawn restoration. Correlate with specified maintenance periods.

D. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer .

1.06 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in seeding with three (3) years experience of similar size projects.

1.08 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.

1.09 PROJECT CONDITIONS

A. Utilities: Determine location of underground utilities and perform work in a manner that will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned. Note overhead lines for safety purposes.

B. Fine Grading: When conditions detrimental to seed growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Contractor and Landscape Architect before commencing work.

C. Provide topsoil as required to complete work

1.10 SEQUENCING AND SCHEDULING

A. Permitted seeding time: Seeding shall be performed from April 1 to May 15, or from August 15 to September 30. When permitted in writing by the Landscape Architect, seeding may be performed outside of these limitations.

B. Notify Owner's Representative at least 72 hours prior to seeding to verify project conditions.

C. Coordination with planting: If planting of trees and shrubs is scheduled after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

1.11 WARRANTY

A. Warrant lawns through specified lawn maintenance period to be a smooth and thick lawn, free of weeds, ruts and eroded/bare areas larger than 8" square.

PART 2 PRODUCTS

2.01 SEED MIXTURE

A. Common Areas
   1. Turf Type Tall Fescue: 80% percent.
      a. Provide equal portions of three to four varieties that have been evaluated by NTEP within the last 5 years and was rated within the first group of Least Significant Difference (LSD) in mean Turfgrass Quality.
      b. Seed Growers: Mountain View Seeds, Landmark Turf and Native Seed, DLF Pickseed, Seed Research of Oregon.
   2. Perennial Ryegass: 10% percent.
      a. Provide equal portions of variety that has been evaluated by NTEP within the last 5 years and was rated within the first group of Least Significant Difference (LSD) in mean Turfgrass Quality.
      b. Seed Growers: Mountain View Seeds, Landmark Turf and Native Seed, DLF Pickseed, Seed Research of Oregon.
   3. Kentucky Bluegrass: 10% percent.
      a. Provide equal portions of one variety that has been evaluated by NTEP within the last 5 years and was rated within the first group of Least Significant Difference (LSD) in mean Turfgrass Quality.
      b. Seed Growers: Mountain View Seeds, Landmark Turf and Native Seed, DLF Pickseed, Seed Research of Oregon.

2.02 SOIL MATERIALS

A. Topsoil: Excavated from site, see Section 31 2200 Grading.

2.03 ACCESSORIES

A. Mulching Material:
   1. Paper or Cellulose Mulch, made from recycled newsprint, applied at a rate between 1000 - 1200 pounds per acre.
   2. Pelletized Mulch, composed of 20% recycled wood and 80% recycled paper, applied at 1100 to 1300 pounds per acre.
   3. Combination Mulch, made from a mixture of wood and paper mulch.
   4. Bonded Fiber Matrix

B. Fertilizer: as indicated in analysis;or to the following or equal proportions

1. Nitrogen: **[19]** percent.
2. Phosphoric Acid: **[19]** percent.
3. Soluble Potash: 19 percent

C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.
   1. Contractor shall furnish necessary equipment attachments and accessories for adequate irrigation of seeded areas.

D. Erosion Fabric: Jute matting, open weave.

E. Pre-Plant Herbicide: Syngenta Tenacity or equal.

F. Erosion Hydromulch: Profile Products Flexterra HP-FGM.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

B. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected

D. Ensure SWPPP plan is adhered to and any areas with potential erosion issues are noted in the pre-planting coordination meeting with the Landscape Architect. Any issues noted shall be corrected as soon as is practicable prior to seeding.

E. Coordinate work with Landscape Contractor.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 22 00.

B. Place topsoil in accordance with Section 31 22 00.

C. Establish lines for seeding, sod, and planting bed prior to seeding. Identify areas to receive different seed mixes (Prime, Common, Utility, Detention Basin, Sports Turf).

D. Remove all debris, roots, branches, and stones in excess of 1 inch.

E. Uniformly grade areas within project limits including adjacent transition areas.
   1. Smooth finish surface within specified tolerances, grade in uniform levels or slopes between points where elevations are shown and between points and existing grades. Roll and rake, remove ridges, and fill depressions to meet finish grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
   3. Provide additional topsoil if required
   4. Tolerances
      a. Top Surface of Finish Grade: Plus or minus the following inches from required elevation over 25 feet in any direction.
         1) Common: 3/4 inch

3.03 FERTILIZING

A. Apply fertilizer Apply fertilizer in accordance with recommendations based on stockpile and placed soil test results; or at a minimum rate of [0.5 pounds Nitrogen, 0.5 pounds Phosphorus, 0.5 pounds Potassium per thousand square feet].

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Lightly water to aid the dissipation of fertilizer.

3.04 GENERAL SEEDING

A. Equipment
   1. Hydroseeding on Common, Utility and Detention Basin Areas
      a. Finn, Kincaid, Epic Manufacturing or Approved Equal

B. Method – General Seeding
   1. Apply seed in two directions on a 30-degree angle at a rate equal to one-half the full seeding rate in each direction.
   2. Seed shall have no greater than 1/8" soil cover for optimum germination.
   3. Roll seed bed with tow-behind roller less than one ton in weight. Hand tamp bed and sidewalk edges as needed.
   4. Apply Syngenta Tenacity herbicide or an approved equal with the active ingredient of mesotrione (40% active ingredient) at a rate of 5 fluid ounces per acre.
   5. Install erosion control materials as specified on the site plan.
      a. 70/30 wood fiber hydromulch at 2,000 pounds per acre
      b. Profile Products Flexterra HP at 3,000 pounds per acre or higher based on manufacturer's recommendations for slope gradient
      c. Do Not Use straw

C. Seeding Rates
   1. Seed shall be applied by a properly calibrated primary or hydroseeding apparatus at a rate noted below per thousand square feet
      a. Common Areas: 10 pounds;
   2. Apply seed evenly in two intersecting directions (passes) at 30-degree angles.
   3. Do not seed areas in excess of that which can be mulched on same day.
   4. Seed blends or mixtures with coated or treated seed shall be seeded at the specified rate multiplied times 1.5 during the spring, summer, and dormant seeding windows.
   5. Seed blends or mixtures planted during the dormant seeding window shall be seeded at the specified rate multiplied times 1.25. If using coated or treated seed, additional multiplier must also be used.

D. Planting Season
   1. Spring Seeding: April 1st to May 15th
   2. Fall Seeding: August 21st to October 15th
   3. Dormant Seeding: August 21st to December 31st

E. Do not sow immediately following rain, when ground is too dry, or during windy periods.

F. Using caution to protect grades and other plant material, roll seeded area with roller not exceeding 2000 lbs.

G. Apply water with a fine spray immediately after each area has been mulched. Saturate to 2 inches of soil.

H. Following germination, immediately re-seed areas without germinated seeds that are larger than 8 by 8 inches until such time as the area achieves 95 percent coverage of desirable turfgrass with no more than 5 percent weeds and/or bare areas.

3.05 HYDROSEEDING

A. Mix seed specified, fertilizer, and pulverized mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

B. Apply slurry uniformly to all areas to be seeded. Rate of application as required to obtain specified seed sowing rate as noted above.

C. Apply water with a fine spray immediately after each area has been mulched. Saturate to 2 inches of soil.

D. Following germination, immediately re-seed areas without germinated seeds that are larger than 8 by 8 inchesuntil such time as the area achieves 95 percent coverage of desirable turfgrass with no more than 5 percent weeds and/or bare areas.

3.06 RECONDITIONING EXISTING LAWNS

A. Recondition existing lawn areas damaged or left unmanaged by Contractor's operations including, but not limited to, storage of materials and equipment and movement of vehicles. Also recondition existing lawn areas where minor regrading, filling of low spots and removal of humps, is required for a smooth, level lawn.

B. Remove diseased and unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from construction, including but not limited to, oil drippings, stone, gravel or other loose materials.

C. Using a lawn aerator, aerate the soil to disrupt a minimum of 3 percent of the surface area at a minimum depth of 3 inches.

D. Remove weeds by hand or with a selective chemical weed killer as required.

E. Mow lawn short (1-1.5") and slice seed at a rate of 50 percent of the specified seeding rate based on location of lawn area. Bare spots should be treated at the rate recommended for new seeding. After seed is deposited, top dress the lawn/seed area with compost to lightly cover the seed and water in well.

F. Discourage foot traffic and keep soil moist until seed germination.
   1. Prime Areas: Install snow fence around the perimeter of the area to discourage foot traffic and keep soil moist until seed germination.

3.07 REPAIR AND RESTORATION

A. Contractor to maintain the original grades of the slopes after commencement of planting operations and during the maintenance period. Damage to the finished surface shall be promptly repaired. In the event erosion occurs from rainfall or other causes such damage shall be promptly repaired after each occurrance during the maintenance period and documented through field reports submitted to Owner and Architect . Ruts, ridges, tracks, and other surface irregularities shall be corrected and areas replanted where required prior to final acceptance by Landscape Architect. Utilize straw bales or wattles to mitigate water eroding slopes, protect area until establishment then remove or move down to establish additional areas.

B. Plant Materials: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

C. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition, but not less than the following periods:
   1. Seeded lawns: Until the date of Final Acceptance by Landscape Architect or as long as may be necessary to produce a uniform stand of grass.

a. When full maintenance period has not elapsed before the end of the growing season, or if the lawn is not fully established, the maintenence period shall continue into the next growing season

D. For the purpose of establishing an acceptable standard, scattered bare spots, none of which is larger than 8 inches by 8 inches, will be allowed up to a maximum of 5 percent of the lawn area. Areas not meeting this requirement will be reseeded on an ongoing basis until this performance standard has been achieved.

E. Mow grass at regular intervals to maintain at a maximum height of 3 inches. Do not cut more than 1/3 of grass blade at any one mowing.

F. Neatly trim edges and hand clip where necessary.

G. Immediately remove clippings after mowing and trimming.

H. Water to prevent grass and soil from drying out.

I. Roll surface to remove minor depressions or irregularities.

J. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

K. Immediately reseed areas that show bare spots.

L. Protect seeded areas with warning signs during maintenance period.

END OF SECTION 32 92 19

SECTION 32 93 00
PLANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. New trees, plants, and ground cover.

B. Mulch and Fertilizer.

C. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Topsoil storage.

B. Section 31 23 23 - Fill: Topsoil material.

C. Section 32 9219 - Seeding

1.03 DEFINITIONS

A. Weeds: Include but not limited to, Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

B. Plants: Living trees, plants, and ground cover specified in this Section , and described in ANSI Z60.1.

1.04 REFERENCE STANDARDS

A. ANSI/AHIA Z60.2 - American Standard for Nursery Stock; 2025.

B. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.

C. NAA (STDS) - Pruning Standards for Shade Trees; National Arborist Association; current edition.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Convene a meeting two weeks before starting planting to discuss coordination, planting details and topsoil acceptance
   1. Require attendance by personnel responsible for grading and installers of planting, seeding and adjacent work
   2. Include representatives of Contractor.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Maintenance Data: Include cutting and trimming recommendations for plants, owner should be encouraged to not prune plants unless necessary; types, application frequency, and recommended coverage of fertilizer .

C. Submit list of plant life sources.

1.07 QUALITY ASSURANCE

A. Nursery Qualifications: Company specializing in growing and cultivating the plants with three years documented experience.

B. Installer Qualifications: Company specializing in installing and planting the plants with three (3) years experience of similar size projects,

C. Plants shall conform to names indicated on the drawings and plant list and to the nomenclature listed in the American Joint Committee on Horticultural Nomenclature' s 'Standardized Plant Names", latest edition.

D. Size, quality, handling, planting and maintenance of plant materials shall be in accordance with "American Standard of Nursery Stock", American Nursery & Landscape Association. Minimum acceptable sizes of plants, measured before pruning with branches in normal position, shall conform to measurements specified in the plant list.

E. Maintenance Services: Performed by installer.

1.08 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of plants, fertilizer and herbicide mixture.

C. Plant Materials: Certified by federal department of agriculture; free of disease or hazardous insects.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

B. Prepare, transport and handle plants to ensure protection against injury. Cover all plants while transporting to and from the site.

C. Deliver plants with legible waterproof identification labels.

D. Deliver plant life materials immediately prior to placement.
   1. Plants shall remain on the site of the work no longer than three days prior to being planted or placed in storage.
   2. The earth balls shall be kept moist and their solidity carefully preserved. To prevent drying out or freezing, store plants in a compact group with a suitable mulch material placed around and between the balls so they are completely covered. The duration of storage, method of storage of plants and mulch material shall be acceptable to the Landscape Architect.

1.10 FIELD CONDITIONS

A. Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 90 degrees F.

B. Do not install plant life when wind velocity exceeds 30 mph.

C. Install plant materials during time periods indicated. Planting operations conducted at other times are at the option and full responsibility of the Contractor and without additional compensation, except as otherwise agreed to by the Landscape Architect and Owner.
   1. Plant Materials:
      a. March 1 to June 15
      b. September 1 to November 1
   2. When planting operations vary, plant early in the day. When planting occurs in the summer, apply anti-desiccant spray to plantings after leaves become full size.

1.11 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Warranty:
   1. Guarantee unconditionally labor and plant materials for a period of one year after Landscape Architect's acceptance. Replace at Contractor's expense all plant materials

that die during guarantee period. At end of guarantee period, replace all material not showing definite and satisfactory life and growth.

2. During guarantee period, replace plants that die or are, in the Landscape Architect's opinion, in an unhealthy, unsightly, or badly impaired condition. Make no replacements in any season unfavorable for planting. Provide replacement plants of the same kind and size as specified in the plant list, and meeting all requirements of these specifications.
3. Initial inspection of planting will be made by Landscape Architect at completion of planting. Guarantee period shall begin at date of acceptance.

C. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

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. Plant Materials:
1. Provide healthy, sound, vigorous plant materials, free from plant diseases, insect pests, or their eggs, with healthy well-developed root systems; freshly dug, nursery-grown, well-branched, densely foliated when in leaf, and well-proportioned, particularly with respect to the width-height relationship, hardy under climatic conditions similar to those of the project.
2. Damaged or broken branches, broken ball, and loose top in ball are not acceptable. Provide balled and burlapped plants, designated B&B, adequately balled with firm natural balls as set forth in the ASNS. Firmly wrap balls with burlap or approved cloth secured in place.
3. Obtain the Landscape Architect's specific written approval for substitution of plants other than those named in the plant list. Proposed substitutes shall have essentially the same characteristics as plants specified in appearance, ultimate height, shape, habit of growth, general soil and other requirements. Average cost and value of substituted plants shall be no less than cost and value of plants specified. Plants of greater value may be accepted without additional cost to the Owner.
4. Provide container-grown stock with root system sufficiently developed to hold soil together, firm and whole. No plants shall be loose in containers; nor pot-bound.
5. Size range and measurement of height and caliper of all material shall be as specified in the ASNS.

2.02 SOIL MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0.

B. Topsoil to contain 3-8 organic matter

C. Soil shall have the following USDA particle size analysis. Sand, silt and clay shall be determined by ASTM D422
1. Gravel: Plus 2mm. Less than 10%
2. Sand: .05mm to .2mm. 15-40%
3. Silt: .002 to .05mm. 25-65%
4. Clay: minus .002mm. 20-35%

2.03 SOIL AMENDMENT MATERIALS

A. Fertilizer: Containing fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis..

B. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 85 percent organic material measured by oven dry weight, pH range of 4 to 5; moisture content of 30 percent.

C. Composted Organic Material: Mature, stable humus-like material derived from aerobic decomposition. The compost shall be dark brown to black in color and capable of supporting plant growth.
   1. Carbon to Nitrogen ratio not to exceed 35 to 1.

D. Bone Meal: Raw, finely ground, commercial grade, minimum of 3 percent nitrogen and 20 percent phosphorous.

E. Lime: Ground limestone, dolomite type, minimum 95 percent carbonates.

F. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of plants.

2.04 MULCH MATERIALS

A. Mulching Material: Hardwood species wood shavings, free of growth or germination inhibiting ingredients containing no sticks larger than 1/4 inch in diameter, stones, clay or other foreign material that will prevent eventual decay of the mulch necessary for its complete effectiveness.

2.05 ACCESSORIES

A. Wrapping Materials: Burlap

B. Low Profile Gator Bags
   1. Made of green polyethylene plastic with nylon webbing.
      a. Two water release points per bag for even watering.
      b. UV stabilized to withstand exposure to sunlight.
   2. Single bag holds approximately 15 gallons.
   3. Manufacturers:
      a. Spectrum Products Inc.: www.treegator.com
         1) Tree Gator 15-Gallon Treegartor Pro Jr#98185R:
      b. A.M. Leonard: www.amleo.com
         1) OOZE Tube Tree Watering Tube 15 gallon Green
      c. R.L. Nelson: www.lrnelson.com
         1) Nelson Slow Release Tree Soaker and Watering Ring, 3-Foot Diameter #50800
      d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Guying and Staking Material:
   1. Tree stakes: 2" x 2" x 8' hardwood.
   2. Hose: High quality braided rubber or plastic hose, 3/4 inch diameter and suitable length. Color-black.
   3. Wire: 12 gauge galvanized steel
   4. Guying cable: Galvanized steel, #9 gauge. Thimbles and nicroress clips shall be used for connections and splices.
   5. Turnbuckles: galvanized or zinc dip painted with an 8 inch length-wise opening fitted with eyebolts.
   6. Guying stakes: 2" x 4" x 33", notched hardwood.

D. Edging: All plant beds are to have a 45 degree angle spade formed edge.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared, amended subsoil is in place in planters and plan beds are ready to receive work.

B. Saturate soil with water to test drainage.
   1. Notify Landscape Architect if water sits in hole when surrounding ground is not saturated.

3.02 FERTILIZING

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

B. Apply after initial raking of topsoil.

C. Mix thoroughly into upper 2 inches of topsoil.

D. Lightly water to aid the dissipation of fertilizer.

3.03 PLANTING

A. Place plants for best appearance.

B. Set plants in center of pits plumb and straight and at such a level that after settlement, plants will bear same relation to finished grade of surrounding ground as to grade of ground from which plants were dug.

C. Remove non-biodegradable root containers.

D. Set plants in pits or beds, partly filled with prepared plant mix, at a minimum depth of 6 inches under each plant. Remove burlap, ropes, and wires, from the root ball.

E. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture in 6 inch layers. Maintain plant life in vertical position.

F. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

3.04 INSTALLATION OF ACCESSORIES

A. Place mulch, where indicated on drawings. Tree rings, hedge rectanglar bed and larger beds as shown

B. Place Gater Bags at base of trees and fill with water.
   1. Use on trees with branches at least 30" off the ground.
   2. Install between April 1st and June 1st. Avoid installing before last frost of year to ensure bags will not freeze and crack.
   3. Uninstall no later than October 15th and turn over to owner for reuse the following spring.

C. Wrap deciduous shade and flowering tree trunks and place tree protectors.

3.05 PLANT SUPPORT

A. Brace plants vertically with plant protector wrapped guy wires and stakes to the following:
   1. Single Trunk Tree Caliper: 1 to 3 inches; Tree Support Method: 2 wooden stakes with two ties
   2. Multi Stem Tree: Tree Support Method: 3 guy wires with hose protection around trunk secured with 3' wooden stakes and containing turnbuckles and flagging tape

3.06 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 43 00.

B. Plants will be rejected if a ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

3.07 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. Irrigate sufficiently to saturate root system and prevent soil from drying out.

C. Cultivate and weed plant beds and tree pits.

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. Water to prevent soil from drying out.

H. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.

I. Control insect damage and disease. Apply pesticides in accordance with manufacturers instructions.

J. Remedy damage from use of herbicides and pesticides.

K. Replace mulch when deteriorated.

L. Maintain wrappings, guys, turnbuckles, and stakes. Adjust turnbuckles to keep guy wires tight. Repair or replace accessories when required.

3.08 ADJUST AND CLEAN

A. Upon completion of planting and prior to acceptance, remove excess soil and debris from site and repair all damage to structures and site improvements, resulting from planting operations.

B. Sweep and hose down paved surfaces affected by planting operations.

END OF SECTION 32 93 00