

CONSTRUCTION DOCUMENTS PROJECT MANUAL

FOR

Tipp City Schools New Bus Maintenance Building

575 N. Hyatt Street
Tipp City, Ohio 45371

OWNER

Tipp City Exempted Village School District

90 S. Tippecanoe Drive
Tipp City, Ohio 45371

Book 1 of 1



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

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SECTION 00 11 13 - ADVERTISEMENT FOR BIDS

Sealed proposals will be received by Tipp City Exempted Village School District at, 90 S Tippecanoe Dr, Tipp City, OH 45371, until March 6, 2:00.00pm, at which time and place proposals will be opened publicly and read aloud. Proposals received after March 6, 2:00.00pm will be returned unopened. Proposals shall be for the furnishing of materials and the performance of labor necessary for the:

24054.02 Tipp City Schools New Bus Maintenance Building
575 N. Hyatt Street
Tipp City, Ohio 45371

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 2:00 pm on February 18, 2025 at 575 N. Hyatt Street. 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 Tipp City Exempted Village School District; 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 Tipp City Exempted Village School District web site.

Notice can be accessed at: www.tippcityschools.com.

The Date of this notice: February, 11 2025

By: Tipp City Exempted Village School District
Tipp City, Ohio 45371

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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: 24054.02 Tipp City Schools New Bus Maintenance Building
575 N. Hyatt Street
Tipp City, Ohio 45371**

GM Project Number: 24054.02

Bid Date: March 6, 2:00.00pm

Bid Categories: Lump Sum General Contract

Estimate of Construction Cost: \$ 2,000,000

PROJECT SCOPES OF WORK

General Construction: New 5,000 SF bus maintenance garage. Pre-engineered metal building with brick wainscot. High bay for the maintenance of vehicles and a low bay that includes offices, break room, toilet room, and storage.

Site Work: Grading and utilities to support the new building. A large fenced in parking area for busses, and fuel station.

Plumbing Work: Large trench drains in the high bay area along with a service sink and eye wash. Toilet room in the low bay area.

HVAC Work: Radiant heat system in the high bay area. Furnace and condensing unit for the low bay area.

Electrical Work: Underground feeder from secondary of utility company pedestal at utility pole base to meter. CO/NO self contained system. Power to fuel island. Alternates included.

Technology Work: Technology to the maintenance building and field station.

END OF SECTION

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AIA® Document A701® – 2018

Instructions to Bidders

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

Tipp City New Bus Maintenance Bldg
575 N. Hyatt Street
Tipp City, Ohio 45371

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

Tipp City Exempted Village School District Board of Education
90 S. Tippecanoe Drive
Tipp City, Ohio 45371

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

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

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

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

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

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

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.

§ 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.)

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

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

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

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

§ 6.2 Owner's Financial Capability

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

§ 6.3 Submittals

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

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

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

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

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

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

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

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

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.

(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds

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

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

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

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

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

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

- .1 AIA Document 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
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.7 Addenda:

Number	Date	Pages
---------------	-------------	--------------

.8 Other Exhibits:

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

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

The Sustainability Plan:

Title	Date	Pages
--------------	-------------	--------------

Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
-----------------	--------------	-------------	--------------

.9 Other documents listed below:

(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

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 2:00 pm on February 18, 2025 at 575 N. Hyatt Street. 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 Paragraph 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 Project Manager; bwolf@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 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

**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:
 - 1. This survey identifies grade elevations prepared primarily for the use of Architect in establishing new grades and identifying natural water shed.
- C. Geotechnical Report: Entitled, Soil Study for Proposed Tipp City School Project, Phase 1a, dated Forthcoming.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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**SECTION 00 41 13 - BID FORM
THE PROJECT AND THE PARTIES**

TO:

Tipp City Exempted Village School District
90 S Tippecanoe Dr.
Tipp City, Ohio 45371

FOR:

Project: 24054.02 Tipp City Schools New Bus Maintenance Building

575 N. Hyatt Street
Tipp City, Ohio 45371

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 - Extend pre-engineered metal building by 20' to the South. This alternate will include structural, mechanical and electrical work along with a 2 hour fire barrier between building areas.:

If Alternate 01 is accepted, add:

_____ dollars

Item 1b - Alternate 02 - Future Electric Buses - Provide four (4) 24"x24"x24" deep in-grade pulling boxes. Provide 48"x12"x12" metal NEMA 3R wireway on exterior of electrical room. Provide sixteen (16) 2" conduits stubbed from metal wireway on exterior wall of electrical room to in-grade pulling boxes (four conduits per box) for future EV bus chargers.:

If Alternate 02 is accepted, add:

_____ dollars

Item 1c - Alternate 03 - Base bid to provide 3'-4" of brick surrounding the building with block back up. Deduct alternate to eliminate brick and block and have P.E.M.B. system and interior and exterior metal panel to extend to floor slab.:

If Alternate 03 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: April 14, 2024

Owners desired completion date: October 16, 2025

If this Bid is accepted, we will:

Complete the Work by October 16th 2025 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:
Tipp City Exempted Village School District
90 S Tippecanoe Dr, Tipp City, OH 45371
Tipp City, Ohio 45371

END OF BID FORM

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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

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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 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. Contractors Bidding Information Form: 00 41 13.01 Contractor Bidding Information
- D. Non-Collusion Affidavit: 00 45 19 Non-Collusion Affidavit
- E. Contractor's Affidavit: 00 45 21 Contractor's Affidavit
- F. 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).
- G. 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.
- H. 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

DRAFT 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)

«[Tipp City Exempted Village School District Board of Education](#)»« »
«[90 S. Tippecanoe Drive](#)
[Tipp City, Ohio 45371](#)»
« »
« »

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

« »« »
« »
« »
« »

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

«[Tipp City New Bus Maintenance Bldg](#)»
«[575 N. Hyatt Street](#)
[Tipp City, Ohio 45371](#)»
« »

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

«[Garmann/Miller & Associates, Inc.](#)»« »
«[38 S. Lincoln Drive, P.O. Box 71](#)
[Minster, Ohio 45865](#)»
« »
« »

The Owner and Contractor agree as follows.

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

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.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

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 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
<input type="text"/>	<input type="text"/>

§ 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
<input type="text"/>	<input type="text"/>

§ 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
<input type="text"/>	<input type="text"/>	<input type="text"/>

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

Item	Price
<input type="text"/>	<input type="text"/>

§ 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)
<input type="text"/>	<input type="text"/>	<input type="text"/>

§ 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.)

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:

(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.
(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)

«Mark Stefanik»
«90 S. Tippecanoe Drive
Tipp City, Ohio 45371»
« »
« »
« »
« »

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

« »
« »
« »
« »
« »
« »

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

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document 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:

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)

«Mark Stefanik»«Superintendent»

(Printed name and title)

« »

CONTRACTOR (Signature)

« »« »

(Printed name and title)

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, Tipp City Exempted Village School District, its successors and assigns on the job site located at: 575 N. Hyatt Street, City, Ohio 45371.

This release covers a progress payment for labor, material, and equipment furnished on the Tipp City Bus Garage.

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: 24054.02 Tipp City Schools New Bus Maintenance Building, 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

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Request for Information

FORM 00 63 13

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

RFI no. _____

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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AIA[®] Document A201[®] – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

Tipp City New Bus Maintenance Bldg
575 N. Hyatt Street
Tipp City, Ohio 45371

THE OWNER:

(Name, legal status and address)

Tipp City Exempted Village School District Board of Education
90 S. Tippecanoe Drive
Tipp City, Ohio 45371

THE ARCHITECT:

(Name, legal status and address)

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

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- 13 MISCELLANEOUS PROVISIONS
- 14 TERMINATION OR SUSPENSION OF THE CONTRACT

ADDITIONS AND DELETIONS:

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

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

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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

§ 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.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

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

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any

direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

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

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

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

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

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

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

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

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

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

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with

reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

.4 As provided in Section 7.3.4.

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

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

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

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

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

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the

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

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

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

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

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;

- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

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

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

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

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

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

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds

of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

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

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

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

§ 11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the

other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

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

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance,

the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

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

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

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

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

§ 15.2 Initial Decision

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

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

Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

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

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

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

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

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

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

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

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

§ 15.4.4 Consolidation or Joinder

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

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

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

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:

Tipp City Exempted Village School District
Tipp City, Ohio 45371

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.

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 Basic Building Code. The owner will pay for the sprinkler and fire alarm fees as required by the Ohio Basic 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	\$100.00
More than \$50,000.00 to \$150,000.00	\$200.00
More than \$150,000.00 to \$500,000.00	\$300.00
More than \$500,000.00 to \$2,000,000.00	\$400.00
More than \$2,000,000.00 to \$5,000,000.00	\$500.00
More than \$5,000,000.00	\$1,000.00

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 policies 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

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Division 01

General Requirements

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**SECTION 01 11 00
SUMMARY OF WORK**

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: 24054.02 Tipp City Schools New Bus Maintenance Building
- B. Owner's Name: Tipp City Exempted Village School District
- C. Architect's Name: Garmann/Miller & Associates Inc.
- D. 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 for installation by Contractor:
 - 1. Soap Dispensers.
 - 2. Paper Towel Dispensers.
 - 3. 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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**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 Maintenance 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

**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 \$40,000.00 for use upon Owner's instructions.
- B. Contingency Allowance: P.E.M.B. foundation design based off selected manufacturer's building reactions. Include the stipulated sum/price of \$10,000 for use upon Owner's instructions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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**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 No. 1 - Extend pre-engineered metal building by 20' to the South. This alternate will include structural, mechanical and electrical work along with a 2 hour fire barrier between building areas.
- B. Alternate No. 2 - Future Electric Buses - Provide four (4) 24"x24"x24" deep in-grade pulling boxes. Provide 48"x12"x12" metal NEMA 3R wireway on exterior of electrical room. Provide sixteen (16) 2" conduits stubbed from metal wireway on exterior wall of electrical room to in-grade pulling boxes (four conduits per box) for future EV bus chargers.
- C. Alternate No. [3] - Base bid to provide 3'-4" of brick surrounding the building with block back up. Deduct alternate to eliminate brick and block and have P.E.M.B. system and interior and exterior metal panel to extend to floor slab.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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**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.

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 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Submittals will be marked as follows: Contractor to take the following action for each respective marking.
 - 1. No Exceptions Taken:
 - a. Procurement/Fabrication may proceed.
 - b. Copies to be distributed as scheduled.
 - 2. Note Markings and Confirm
 - a. Procurement/Fabrication may proceed based on marks.
 - b. Confirm compliance with markings with a letter on company letter head or resubmitted shop drawings.
 - 3. Note Markings, Revise and Resubmit:
 - a. Correct markings on submittal.
 - b. Corrected shop drawings shall be resubmitted before final procurement and fabrication.
 - c. Do not use drawings marked 'resubmit' to be use in conjunction with installation of work.
 - 4. Rejected/Incomplete Submittal: Correct submittal and resubmit in its entirety. No Procurement/Fabrication shall start until shop drawings have been completely revised, resubmitted and marked No Exceptions Taken or Note Markings and Confirm.
 - a. Correct submittal and resubmit in its entirety.
 - b. No Procurement/Fabrication shall start until shop drawings have been completely revised, resubmitted and marked No Exceptions Taken or Note Markings and Confirm.
- D. Samples will be reviewed for aesthetic, color, or finish selection.
- E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.09 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Warranties and Bonds.
 - 5. Certifications indicating no asbestos and lead solder in potable water systems have been incorporated into the work.
 - 6. Sign in sheet for Demonstrations and Instructions
 - 7. Signed receipt for Maintenance Materials (attic stock)
 - 8. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.11 NUMBER OF COPIES OF SUBMITTALS

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

3.12 SUBMITTAL PROCEDURES

- A. General Requirements:
- B. Shop Drawing Procedures:
 - 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
 - 2. Do not reproduce the Contract Documents to create shop drawings.
 - 3. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.
- C. Transmit each submittal with a copy of approved submittal form.
 - 1. See Section 01 33 32 Contractor Submittal Form
 - 2. Electronic copy for use in conjunction with this project is available upon request.

- D. Sequentially number the submittal form. Number revised submittals with original number and a sequential alphabetic suffix.
- E. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- F. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- G. Electronic Copy Submittals
 - 1. This procedure is for submission only and is not considered a file management system.
 - 2. Electronic file to be an editable PDF file. Create PDFs at native size and right-side up; illegible files will be rejected.
 - 3. Submit electronic file to Garmann/Miller & Associates Inc's FTP site in the appropriate project file.
 - a. Notify Garmann/Miller & Associates Inc of submission to FTP site via email to Garmann/Miller & Associates' Project Manager, Project Manager; bwolf@creategm.com, and Submittal Coordinator Project Manager; bwolf@creategm.com.
 - b. Architect will notify via email the Contractor's Project Manager and Submittal Coordinator when the Contractor submittal has been reviewed and placed on the FTP site.
 - c. Contractor to remove submittal from FTP site.
 - 4. Submit two (2) hard copies to Garmann/Miller & Associates Inc. business address at the same time as electronic submission.
 - a. Hard copies will not be returned to contractor
 - b. Some specification sections may require additional hard copies. Refer to each section for additional requirements.
 - 5. Contractor to make hard copy for the project site.
 - 6. Contractor to make hard copies for owner's operation and maintenance manuals
- H. Schedule submittals to expedite the Project, and coordinate submission of related items.
- I. For each submittal for review, allow 15 business days excluding delivery time to and from the Contractor.
- J. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- K. Provide space for Contractor and Architect review stamps.
- L. When revised for resubmission, identify all changes made since previous submission.
- M. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- N. Submittals not requested will not be recognized or processed.

3.13 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 - 2013, Digital Data Licensing Agreement as modified by the Architect for this project.

END OF SECTION

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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

creategm.com

Project name : _____

Contractor name : _____

Contact name : _____

Phone : _____

Subcontractor

Company : _____

Contact name : _____

Phone number : _____

Submittal # : _____

Date : _____

Description : _____

Specification section(s) : _____

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

Contractor stamp

Architect stamp

Consultant stamp

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**SECTION 01 41 01
REGULATORY REQUIREMENTS**

PART 1 - GENERAL

1.01 SUMMARY

Section Includes: Governmental regulations and industry standards which are included and incorporated herein by reference and made a part of Contract Documents. This Section also sets forth those notices and permits which are known to Owner and which either must be applied for and received, or which must be given to governmental agencies before start of Work.

1.02 CODES AND REGULATIONS

- A. General Applicability of Codes, Regulations, and Standards: Except to extent that more explicit or more stringent requirements are written directly into Contract Documents, applicable codes, regulations, and standards have same force and effect (and are made a part of Contract Documents by reference) as if copied directly into Contract Documents, or as if published copies are bound herewith.
- B. Contractor Responsibility: Assure that all Work is conducted in compliance with state and federal statutes and regulations. Assure, as far as practicable, that materials are transported and disposed in a manner which complies with state and federal statutes and regulations. Contract with any third party required to transport, dispose, or store aforementioned materials, and warrant that any such third party have fulfilled licensing or certification requirements of state and federal statutes and regulations. Indemnify and hold harmless Owner and its agents for any liability imposed as a result of its or any third party's violation of any state or federal statute or regulation regarding removal, transport, disposal, or storage of materials.
- C. Federal Requirements which govern Work include, but are not limited to, the following:
 - 1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) including, but not limited to:
 - a. "Occupational Exposure to Cadmium"
29 CFR 1926.63
 - b. "Respiratory Protection"
29 CFR 1910.134
 - c. "Respirable Crystalline Silica"
29 CFR 1926.1153
 - d. "Construction Industry"
29 CFR 1926
 - e. "Sanitation"
29 CFR 1926.51
 - f. "Lead Exposure in Construction; Interim Final Rule"
29 CFR 1926.62
 - g. "Access to Employee Exposure and Medical Records"
29 CFR 1910.2
 - h. "Hazard Communication"
29 CFR 1926.59
 - i. "Specifications for Accident Prevention Signs and Tags"

29 CFR 1910.145

- j. "Hazardous Waste Operations and Emergency Response"
29 CFR 1910.120
- k. "Personal Protection Equipment Standard"
29 CFR 1910 Subpart 1

2. U. S. Environmental Protection Agency (EPA) including, but not limited to:

- a. "Notification Requirements; Reportable Quantity Adjustments"
40 CFR 763.117 and 40 CFR 763.302
- b. "Resource Conservation and Recovery Act"
40 CFR 261
- c. "Recycling and Emissions Reduction"
40 CFR 82, Subpart F
- d. "Hazardous Waste Regulations"
40 CFR 260 through 272

D. State Requirements:

- 1. Work shall be performed in accordance with Ohio Basic Building Code (OBBC).

E. Abide by local requirements which govern Work.

1.03 LICENSES, PERMITS AND CERTIFICATIONS

Maintain current licenses, permits, and certifications as required by applicable federal, state, or local jurisdictions for removal, transporting, disposal, or other regulated activity relative to Work of this Contract. Contractor is responsible for submittal and cost of all required licenses, permits, and certificates.

1.04 NOTIFICATION FEES

Pay fees required by this Section.

1.05 POSTING AND FILING OF REGULATIONS

Maintain copies of applicable federal, state, and local regulations noted above in Contractor's field office.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 CERTIFICATE OF PLAN APPROVAL

- A. Submit Drawing(s) for Plan Approval to Ohio Department of Commerce, Division of Industrial Compliance and Division of State Fire Marshal. Obtain Certificate(s) of Plan Approval and associated Addenda and post them as required by Ohio Basic Building Code.
- B. Fees for plan examination(s) shall be included in Base Bid.

3.02 INSPECTION

- A. Work shall be inspected by Ohio Department of Commerce, Division of Industrial Compliance and Division of State Fire Marshal, by applicable Inspector noted on "Certificate of Plan Approval."
- B. Upon completion of Work, furnish to Engineer a Certification of Inspection and Approval from said Inspector(s) before requesting final payment.
- C. Fee(s) for all required inspections shall be included in Bid.

3.03 ORDINANCES, REGULATIONS AND CODES

- A. Work shall be completed in strict compliance with federal, state, and local ordinances and regulations in force at time of execution of Contract including Ohio Basic Building Code and any local codes or ordinances as interpreted by local authorities having jurisdiction.
- B. Update of fuel dispenser weight and measures stickers shall be obtained from local authority at completion of Work.

END OF SECTION

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**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; 2024.
- 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 (if alternate #3 is accepted, inspections will not be needed.)
- 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 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.

3.03 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.

3.04 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

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					

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**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

**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. Connect to Owner's existing power service.
1. Do not disrupt Owner's need for continuous service.
 2. Exercise measures to conserve energy.
- C. Provide temporary electric feeder from existing building electrical service at location as directed.
- D. Complement existing power service capacity and characteristics as required.
- E. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
- F. Permanent convenience receptacles may be utilized during construction.
- G. 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 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.

1.05 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.

1.06 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.

1.07 TEMPORARY WATER SERVICE

- A. Cost of Water Used: 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

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**SECTION 01 60 00
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Sustainable design-related product requirements.
- C. Re-use of existing products.
- D. Transportation, handling, storage and protection.
- E. Product option requirements.
- F. Substitution limitations.
- G. Procedures for Owner-supplied products.
- H. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements
- B. Section 01 43 00 - Quality Assurance: Product quality monitoring.
- C. Section 01 60 00.01 - Substitution Request Form.
- D. Section 22 05 13 - Common Motor Requirements for Plumbing Equipment: Motors for plumbing equipment.

1.03 REFERENCE STANDARDS

- A. NEMA MG 1 - Motors and Generators; 2018.
- 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

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 1 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, Project Manager; bwolf@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

**SECTION 01 60 00.01 - SUBSTITUTION REQUEST FORM
(DURING BIDDING PHASE)**

To: Garmann Miller

Date: _____

Project: 24054.02 Tipp City Schools New Bus Maintenance Building

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 dimensions shown on 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 affect does substitution have on other Contracts or other trades?

What affect 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

**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 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- F. Section 07 84 00 - Firestopping.
- G. 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 tobacco 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

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**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

**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 as 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

Division 02

Existing Conditions

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**SECTION 02 41 00
DEMOLITION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of built site elements.
- B. Selective demolition of building elements for alteration purposes.
- C. Abandonment and removal of existing utilities and utility structures.
- D. 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 1123 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. Remove concrete slabs on grade within site boundaries.
- D. 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 from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. 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.
- E. 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.
- F. 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.
- G. 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.

- H. 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.
- I. 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. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
- D. 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.

- E. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch as specified for patching new work.

3.05 SALVAGE BY CONTRACTOR

- A. Contractor shall remove and deliver items shown on the drawings to be salvaged for reuse/reinstallation or delivery to the owner.
 - 1. Obtain sign receipt when salvaged items have been delivered to the owner.

3.06 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.

3.07 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.

3.08 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

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Division 03

Concrete

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**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. Installer Qualifications: Company specializing in performing work of the type specified and with minimum five years of documented experience.
- E. Summary of test results per paragraph 9.3 of ASTM E1745
- F. Manufacturer's samples and literature.
- G. Manufacturers installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
- H. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.
- I. 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:
 - 1. Having minimum of five (5) years documented experience.
 - 2. 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 prior to placing concrete.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 UNDER-SLAB VAPOR BARRIER

- A. Vapor Barrier:
 - 1. Manufacturers:
 - a. Basis of Design:
 - 1) Stego Wrap Vapor Barrier (15 mil); Stego Industries, LLC;
www.stegoindustries.com.

- b. 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. Vapor barrier and installation accessories for installation under concrete slabs, per ASTM E1745; The use of single ply polyethylene is strictly prohibited.
- 3. Materials:
 - a. Installation: Comply with ASTM E1643.
 - b. Maintain permeance of less than 0.01 Perms as tested in accordance with mandatory conditioning test per ASTM E1745, Section 7.1 (7.1.1 - 7.1.5)
 - c. Strength: Meeting or exceeding strength per ASTM E1745, Class A
 - d. Minimum Thickness: 15 Mils
 - e. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
- 4. Vapor Barrier Accessories:
 - a. Seams: Stego Tape
 - b. Sealing Penetrations of Vapor Barrier: Stego Mastic & Stego Tape
 - c. Perimeter Edge seal:
 - 1) Stego Crete Claw
 - 2) Stego Term Bar
 - 3) Stego Tack Tape, double sided tack tape
 - d. Penetration Prevention: Beast Foot by Stego Industries, LLC.
 - e. 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. Ensure that subsoil / subbase is approved by Architect or Geo-technical Engineer before beginning installation.

3.02 INSTALLATION - BARRIER SHEET

- A. Comply with ASTM E1643.
- B. Lap joints 6 inches, minimum. Seal joints, seams, penetrations, and edges at adjacent materials with manufacturer's recommended products and follow manufacturer's written instructions.
- C. Install barrier in accordance with ASTM E1643.
 - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement of concrete whenever possible.
 - 2. Extend barrier to the perimeter of the slab and turn up. Terminate barrier at the top of the slab, otherwise;
 - a. at a point acceptable to the structural engineer,
 - b. where obstructed by impediments such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier.
 - 3. At a point of termination, seal vapor barrier to the foundation wall, grade beam, or slab itself.

- a. Seal vapor barrier to the entire slab perimeter using Crete Claw material per manufacturer's instructions.
 - b. Seal vapor barrier to the entire perimeter wall or footing / grade beam with double sided Tack Tape, or both Term Bar and Tack Tape per manufacturer's instructions.
 - c. Ensure the concrete is clean and dry prior to adhering tape.
4. Apply seam tap / Crete Claw to clean and dry vapor barrier.
 5. Seal all penetrations (including pipes) per manufacturer's instructions.
 6. For interior forming applications, avoid the use of non-permanent stakes driven through the vapor barrier. Use blunt end and or threaded nail stakes (screed pad post) and insert into Beast Foot. Ensure Beast Foot's peel-and-stick adhesive base is fully adhered to the vapor barrier.
 7. If non-permanent stakes must be driven through the vapor barrier, repair as recommended by vapor barrier manufacturer.
 8. Use reinforcing bar supports with base section that eliminate or minimize the potential of puncture of the vapor barrier.
 9. Repair damaged areas with vapor barrier material of same or better permeance, puncture, and tensile strength.
 10. For vapor barrier-safe concrete screeding applications, install Beast Screed (vapor barrier-safe screed system) per manufacturer's instructions prior to placing concrete.

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

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**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 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.

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. Silica Fume, Microsilica: ASTM C1240
- C. Water: Potable.
- D. Aggregates:
 - 1. Normal weight aggregates: conform to ASTM C33, (4.2.1.2).
 - 2. Coarse aggregate: 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. Premolded expansion joint filler: ASTM D1751.
- H. 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/m² when applied at 300 ft²/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
- I. 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
- J. Grout for masonry core fill: ASTM C476, coarse type.
- K. 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.
- L. 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.
- M. 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.
- N. 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.
- O. 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
- P. 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
- Q. 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	2,000 PSI	F0	---	---
Footings & Interior Column Piers	3,500 PSI	F1	0.55	optional
Interior Slabs on Grade	4,000 PSI	F0	0.45	optional
Exterior Foundation Stem Walls, Foundation Walls, & Exterior Column Piers	4,500 PSI	F2, C1	0.45	5%-7%
Exterior, Unreinforced 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) 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.
- 4) 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.
- 5) 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.
- 6) 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.
- 7) Total supplemental cementitious material shall not exceed 35% of the total cement weight.
- 8) 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.
- 9) Concrete for slabs on grade must include a mid-range or high-range plasticizer.
- 10) 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.
- 11) 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 and shoring:
 - 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.
 - 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 $\frac{1}{4}$ 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 ($\frac{1}{2}$ inch thick) and at walls ($\frac{1}{8}$ 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 $\frac{1}{2}$ 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.

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.
- 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 1/2" 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 3/4" wide or 1/2" deep.
 - b. Remove projections larger than 1/2".
 - 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 DELIVERY, STORAGE, AND HANDLING

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

1.06 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
- B. 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/#s
 - 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/#sle
 - f. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 GENERAL

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

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Division 04

Masonry

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**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 21 00 - Clay Unit Masonry

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; 2020.
- 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; 2022.
- 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; 2020.
- I. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength; 2019.
- 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; 2021.
- 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 with ASTM C494/C494M Type C.
 - 1. Acceptable Manufacturers:
 - a. Euclid Chemical: ACCELGUARD 80
 - b. Sika: SikaSet NC
 - c. Master Builders Solutions: MasterSet FP 20
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Bonding Agent: Latex type.
- F. Integral Water Repellent Admixture: Polymeric liquid admixture added to mortar at the time of manufacture.
 - 1. 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.
 - 2. Use only in combination with masonry units produced with integral water repellent admixture.
 - 3. Manufacturers:
 - a. GCP Applied Technologies: DRY-BLOCK Mortar Admixture
 - b. Rheomix: Master Builders, Inc., Cleveland, Ohio
 - c. Moxie International: Moxie Shield 1800 Admixture
 - d. Krete Industries, Inc.: Krete Gard Mortar Mix
 - e. SPEC MIX: IWR Integral Water Repellent Mortar
 - f. 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 "proporttion 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

**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 04 21 00 - Clay Unit Masonry
- F. 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 C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.
- C. ASTM C150/C150M - Standard Specification for Portland Cement; 2020.
- D. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- E. ASTM C476 - Standard Specification for Grout for Masonry; 2022.
- F. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry; 2020.
- G. ASTM E518/E518M - Standard Test Methods for Flexural Bond Strength of Masonry; 2021.

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.
- 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 C 404.
 - 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 C 494 Type C.
 - 1. Acceptable Manufacturers:
 - a. Substitutions: See Section 01600 - 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. Mix grout in accordance with ASTM C94/C94M.
- C. 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.
- D. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- E. Do not use anti-freeze compounds to lower the freezing point of grout.
- F. 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 C 1019 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 C 172.
 - 2) Slump: ASTM C 143; one test for each grout load at point of discharge; and one for each set of compressive strength specimens.
 - 3) Air Content: ASTM C 231; one for every other grout load at point of discharge, or when required by an indication of change.
 - 4) Compressive Strength Tests: ASTM C 1019; 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 01410 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 03300, 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

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 04 43 13 - Stone Masonry Veneer
- F. Section 05 50 00 - Metal Fabrications: Loose steel lintels.
- G. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.
- H. 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; 2009.
- 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.

1.07 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 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 A 951
 - 2. Fabricate from cold-drawn steel wire complying with ASTM A 82, 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 A 615/A 615M 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/A153M, 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. 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, Inc (Dur-O-Wall); Product Lox All 270-EH with compressed 2X hook: www.h-b.com.
 - b. Masonry Reinforcing Corporation of America (Wire Bond); Product Ladder and Eye with HT hook: www.wirebond.com.
 - c. 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) 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 first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Reinforce stack 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 first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

3.07 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of openings.
- C. Place continuous joint reinforcement in first and 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. Reinforce stack 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 first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- 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. Reinforce stacked 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

**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; 2009.
- 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.
- D. ASTM C55 - Standard Specification for Concrete Building Brick; 2011.
- E. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2018.
- F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.
- G. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2014.
- H. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- I. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- J. 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.

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.

1.08 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 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. Wall Guardian; Self Adhering Stainless Steel Flashing: www.stscoatings.com.
 - e. 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.

3. Application: At thru wall flashing end dam, inside corner and outside corner
- 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, 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. Bio Metals 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/sle.
 - b. Masonry Reinforcing Corporation of America, Wire Bond; Product Vertical Expansion Joint: www.wirebond.com.
 - c. Bio Metals 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: To be selected by the Architect
- 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 COLD AND HOT WEATHER REQUIREMENTS

- A. Install cavity mortar control panels continuously throughout full height of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions. Verify that airspace width is no more than 3/8 inch greater than panel thickness. Install horizontally between joint reinforcement. Stagger end joints in adjacent rows. Fit to perimeter construction and penetrations without voids.

3.04 PLACING AND BONDING

- A. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- B. Remove excess mortar and mortar smears as work progresses.
- C. Interlock intersections and external corners.
- D. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- E. 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.
- F. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, or cavity insulation vapor barrier adhesive is applied.
- G. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- H. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.05 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.

3.06 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.

3.07 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.

3.08 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.

3.09 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.

3.10 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.

3.11 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.

END OF SECTION

**SECTION 04 20 00
UNIT MASONRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.

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 04 21 00 - Clay Unit Masonry
- F. Section 05 50 00 - Metal Fabrications: Steel lintels.
- G. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.
- H. Section 07 21 13 - Board Insulation: Insulation for cavity spaces.
- I. Section 07 84 00 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.
- J. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.
- B. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2011.
- C. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2014.
- D. 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 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.08 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. Integral Water Repellent: Provide Integral water repellent at all units exposed to the exterior
 - a. GCP Applied Technologies: DRY-BLOCK Mortar Admixture
 - b. Rheomix: Master Builders, Inc., Cleveland, Ohio
 - c. Moxie International: Moxie Shield 1800 Admixture
 - d. Krete Industries, Inc.: Krete Gard Mortar Mix
 - e. SPEC MIX: IWR Integral Water Repellent Mortar
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
 - 4. 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.
 - 5. 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.

2.02 MORTAR AND GROUT MATERIALS

- A. Masonry Mortaring: Refer to Section 04 05 13
- B. Masonry Grouting: Refer to Section 04 05 16

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.

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

**SECTION 04 21 00
CLAY UNIT MASONRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clay facing brick.

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 04 72 00 - Cast Stone Masonry
- F. Section 05 50 00 - Metal Fabrications: Loose steel lintels.
- G. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.
- H. Section 07 21 13 - Board Insulation: Insulation in cavity spaces.
- I. Section 07 84 00 - Firestopping: Firestopping at penetrations and at top of fire-rated walls.
- J. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- B. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2018.
- C. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2018.
- D. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2014.
- E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.
- F. ASTM C126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units; 2015.
- G. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2021.
- H. ASTM C476 - Standard Specification for Grout for Masonry; 2022.
- I. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- J. 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. Shop Drawings: Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
 - 1. Provide elevations of shear wall reinforcing.

- C. Samples: Submit four samples of facing brick, ceramic glazed facing brick, and ceramic glazed structural clay facing tile units to illustrate color, texture, and extremes of color range.
- 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 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.08 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 BRICK UNITS

- A. Manufacturers:
 - 1. Belden Brick: www.beldenbrick.com/#sle.
 - 2. Bowerston Shale Company, www.bowerstonshale.com
 - 3. Glen Gery, www.glengery.com
 - 4. Substitutions: See section 01 60 00 - Product Requirements.
- B. Manufacturers:
 - 1. Brick to be supplied by one of the following groupings.
- C. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
 - 1. Efflorescence: ASTM C67, "non effloresced"
 - 2. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
 - 3. Compressive strength: As indicated on drawings, measured in accordance with ASTM C67/C67M.
- D. Group A
 - 1. Brick Type 1:
 - a. Belden Brick Company, Canton, Ohio
 - b. Size: Modular 3 5/8"x2 1/4"x7 5/8"
 - c. Color & Texture: Architect to select brick from full range of brick
- E. Substitutions: See section 01 60 00-Product Requirements.

2.02 MORTAR AND GROUT MATERIALS

- A. Masonry Mortaring, refer to Section 04 05 13

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. Brick Units:
 - 1. Bond: Running.
 - 2. Coursing: Three units and three mortar joints to equal 12 inches.
 - 3. Mortar Joints: Concave.

- D. Brick Units:
 - 1. Brick Type 1: Field Brick
 - a. Bond: 1/3 Running.
 - b. Coursing: Three units and three mortar joints to equal 12 inches.
 - c. 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 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.

3.08 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.

3.09 EXPANSION JOINTS

- A. Install expansion joints
 - 1. Where shown on the drawings.
 - 2. In accordance with the Brick Industry Association (BIA) recommendations.
- B. Do not continue horizontal joint reinforcement through 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.

3.10 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.

3.11 CUTTING AND FITTING

- A. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.12 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.

3.13 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. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.
- 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 4000 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.

3.14 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.

3.15 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.

3.16 MASONRY WASTE DISPOSAL

- A. Comply with waste Management requirements of Division 01, Construction Waste Management and Disposal
- B. Excess Concrete Masonry Waste: Remove excess clean concrete waste that cannot be used as fill as described above and other masonry operations waste, and legally dispose of off site.

END OF SECTION

Division 05

Metals

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**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 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)

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.
 - 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.

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. Metal Form Deck (Conform/Centering):
 - 1. Type: 9/16 inches deep, XX ga. Minimum, wide rib, corrugated.
 - 2. Finish: Galvanized.

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. 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.

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. Attach metal deck to supports as indicated in the Structural Drawings.
- C. Hanging Loads: Do not hang items from the underside of metal decks, unless specifically approved by the Architect.
- D. 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.
- E. 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

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**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. Interior load-bearing wall studs and framing.
 - 2. Floor joists.
 - 3. 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 SUBMITTALS

- A. Submit Manufacturer’s product data and installation instructions for each type of cold-formed metal framing and accessory required.
- B. 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.
- C. 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.
- D. 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.
- E. Upon request only, submit mill certificates from the steel producer.

1.05 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.

1.06 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), $F_y = 33$ ksi.
 - 2. 43 mils – 0.0451 inches (18 gauge), $F_y = 33$ ksi.
 - 3. 54 mils – 0.0566 inches (16 gauge), $F_y = 50$ ksi.
 - 4. 68 mils – 0.0713 inches (14 gauge), $F_y = 50$ ksi.
 - 5. 97 mils – 0.1017 inches (12 gauge), $F_y = 50$ ksi.
 - 6. Track and bridging components shall have a minimum $F_y = 33$ ksi.
 - 7. Connection clip angles and vertical or horizontal deflection connections shall have a minimum $F_y = 33$ 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. Fasten hole-reinforcing plates over web penetrations that exceed the manufacturer's standard punched openings.

3.02 INSTALLATION – INTERIOR LOAD BEARING STUD WALLS

- A. Install continuous top and bottom tracks sized to match studs. Align tracks securely 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. Anchor tracks to building framing as recommended by the manufacturer except do not exceed 16 inches on center spacing for nail or power actuated fasteners, or 32 inches on center for anchor rods, expansion and chemical anchors, and other similar types of attachment.
- B. Set studs plumb except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- C. Where stud systems abut structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
- D. Install supplementary framing, blocking and bracing in cold-formed metal framing systems wherever required to provide a complete and stable wall-framing system. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight for loading resulting from item supported.
- E. 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.
- F. 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.
- G. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame, except where more than 2 studs are shown. Provide stud or joist header at all rough openings greater than 24 inches. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.
- H. Provide extra studs, tracks, headers, etc. as required to frame the perimeter of openings.
- I. Provide insulation, as indicated elsewhere, in all double jamb studs, double header members, and other assemblies that will not be accessible to the insulation contractor after erection.
- J. Splicing of load-bearing studs and box headers is not permitted, unless specifically detailed otherwise.
- K. Install steel sheet diagonal straps to both stud flanges, terminate at and fastened to reinforced top and bottom tracks. Fasten clip angle connectors to multiple studs at ends of bracing and anchor to structure.

3.03 INSTALLATION – JOISTS

- A. Install joists directly over and aligned with studs or install a load distribution member at the top track.
- B. Set joists straight, square, plumb, and set joists level except as otherwise shown on the Construction Drawings.
- C. Provide web stiffeners at ends, bearing points, concentrated loads above, and where indicated on the Shop Drawings.
- D. Install joist bridging consisting of solid track blocking secured to the joist webs at intervals indicated:
 1. Spans 0 to 7 feet: none required.
 2. Spans 7 to 14 feet: one row at mid-span.
- E. Install a perimeter track, sized to match the joist depth, at the ends of the members or install blocking between joists at interior supports along the length of the member. Align and securely fasten the tracks or blocking to supporting structure at interior and exterior supports, corners, ends, and at spacing indicated on the Shop Drawings.
- F. Install additional joist under parallel partitions when the partition length exceeds one-half the joist span, and around all floor and roof openings that interrupt one or more joists, unless noted otherwise.

- G. Install miscellaneous joist framing, connections, reinforcing, closure pieces, clip angles, hold-down anchors, and fasteners to provide a complete and stable joist or rafter framing assembly.

3.04 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.

3.05 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 ASTM A780 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.

3.06 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

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**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items including:
 - 1. Pipe bollard
 - 2. Loose steel lintels
 - 3. Loose bearing and leveling plates
 - 4. Miscellaneous framing and supports

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 B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus. 2019
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- D. 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.
- E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).
- F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- H. 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. Pipe: ASTM A 53/A 53M Grade B Schedule 40, black and hot-dip galvanized finish as indicated.
- F. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 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. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.
 - 1. Contractor's option:
 - a. Hand form concrete top
or
 - b. Provide pipe bollard cap finish with a class A formed finish having a symmetrical domed utilizing a minimum of 5000 psi fiber reinforced cementitious material.
Product TopGard by Top Gard LLC; www.topgardcap.com
- B. 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.
- C. 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.
- D. 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 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.

2.05 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, abrasions and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

END OF SECTION

Division 06

Woods, Plastics and Composites

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**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preservative treated wood materials.
- B. Miscellaneous framing and sheathing.
- C. Communications and electrical room mounting boards.
- D. Concealed wood blocking, nailers, and supports.
- E. 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; 2009.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- E. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.
- F. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
- G. PS 1 - Structural Plywood; 2009.
- H. PS 20 - American Softwood Lumber Standard; 2021.
- I. SPIB (GR) - Grading Rules; 2014.
- J. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2018.
- K. WWPA G-5 - Western Lumber Grading Rules; 2021.

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. Subflooring: Structural cementitious subfloor panels. 3/4" USG STRUCTO-CRETE® Brand Structural Panels are a cementitious, alkali-resistant glass-fiber reinforced, noncombustible, structural subfloor panel. Manufactured in accordance with Acceptance Criteria AC318.
1. Size: 48 inches wide nominal, by 96 inches long, nominal.
 2. Thickness: 3/4 inch, nominal.
 3. Edges: Square along width; tongue and groove along length.
 4. Fire Resistance: Noncombustible, when tested in accordance with ASTM E136.
 5. Surface Burning Characteristics: Flame spread index of 0; smoke-developed Index of 0; when tested in accordance with ASTM E84.
 6. Manufacturers:
 - a. USG Corporation; USG Structural Panel Concrete Subfloor: www.usg.com/#sle.
 - b. or approved equal.
- B. Roof Sheathing: APA PRP-108, APA Rated Sheathing, Exterior Exposure Class 1, and as follows:
1. Grade: APA Rated Sheathing.
 2. Bond Classification: Exposure 1.
 3. Performance Category: 19/32 PERF CAT.
 4. Span Rating: 40/20.
 5. Edges: Square.
 6. Trademark: Furnish construction panels factory-marked with a certification mark evidencing compliance with grade requirements
- C. Wall Sheathing: APA PRP-108, APA Rated Sheathing, Exterior Exposure Class 1, and as follows:
1. Thickness: As noted on drawings and as required to complete the work.
 2. Trademark: Furnish construction panels factory-marked with a certification mark evidencing compliance with grade requirements
- D. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- E. Other Applications:
1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.

3. Other Locations: PS 1, C-D Plugged or better.

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.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Preservative Treatment:
 1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber in contact with roofing, flashing, or waterproofing.
 - c. Treat lumber in contact with masonry or concrete.
 - d. Treat lumber less than 18 inches above grade.
 2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 - b. Treat plywood in contact with roofing, flashing, or waterproofing.
 - c. Treat plywood in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.
- B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- C. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 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

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Division 07

Thermal and Moisture Protection

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**SECTION 07 21 13
BOARD INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at foundation perimeter, under floor slabs, and cavity wall construction.
- 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; 2019.
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- F. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2022.
- G. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- 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 Under Concrete Slabs: Extruded polystyrene (XPS) board.
- B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- C. Insulation inside masonry cavity walls: Extruded polystyrene (XPS) 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: 3 inches.
 - 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.
 - f. Manufacturers:
 - 1) Dupont: Styrofoam Brand Cavitymate Ultra XPS Foam Insulation; www.dupont.com
 - 2) Kingspan: Greenguard Type IV XPS Insulation Board; www.kingspan.com
 - 3) Owens Corning: Foamular CW25; www.owenscorning.com
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
- 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.
 - b. Compressive Strength (ASTM D1621): 25 psi, minimum.
 - c. Long-Term Thermal Resistance (ASTM C518): measured at Mean Temp of 75 F: R-5.7 at 1 inch, R-14.4 at 2.5 inches.
 - d. Flexural Strength (ASTM C203): Minimum 55 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. Manufacturers
 - a. DuPont: Thermax XARMOR ci Exterior Insulation; www.dupont.com.
 - b. Rmax: EXOMAX ci FR Air Barrier; www.rmax.com.
 - c. Ox Engineered Products: ISO RED MAX HD; www.oxengineeredproducts.com.
 - d. 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 AT EXTERIOR WALLS

- 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. Tape 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 joint tape.
 2. Apply joint tape over exposed board joints using a squeegee or bristle brush. Ensure tape 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. Tape seal joints between sheets.
 2. Extend sheet full height of joint.
- C. Apply 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 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. Tape insulation board joints and protrusions or interruptions to the insulation plane to maintain continuity of air barrier.
 - 1. Ensure insulation board surfaces are clean, free of dust and dry prior to applying joint tape.
 - 2. Apply joint tape over exposed board joints using a squeegee or bristle brush. Ensure tape adheres to embossed surface.
- H. Joint Sealant: For joints, gaps, and openings less than 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

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**SECTION 07 21 16
BLANKET INSULATION**

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. Section includes mineral fiber batt acoustical insulation.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry
- B. Section 07 84 00 - Firestopping
- C. Section 07 92 00 - Joint Sealants
- D. Section 09 21 16 - Gypsum Board Assemblies

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 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic 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 and ASTM C553.
 - 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: 3.5 inches, or thickness as shown on drawings.

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 3 EXECUTION

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

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**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 seal , with 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 E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. 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.

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. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience.

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 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 overcoat limitations.
2. Insulation: ASTM C 1029, Type I, polyurethane, 15 psi, minimum.
3. Thermal Resistance: R-value of 6.2, 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/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 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. Manufacturers:
 - a. Covestro, LLC; EcoBay CC: www.covestro.com/sprayfoam
 - b. Demilec LLC; HEATLOK HFO High Lift: www.demilec.com
 - c. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com
 - d. Icynene Inc; MD-C-200: www.icynene.com.
 - e. NCFI Polyurethanes: www.ncfi.com
 - f. SWD Yeti: www.swdurethane.com
 - g. 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.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify work within construction spaces or crevices is complete prior to insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.
- B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.
- C. Apply to achieve a thermal resistance R-value of 19 minimum.
- D. Apply overcoat 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

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**SECTION 07 84 00
FIRESTOPPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.
- B. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.
- B. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2020.
- C. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013 (Reapproved 2017).
- D. ITS (DIR) - Directory of Listed Products; current edition.
- E. FM 4991 - Approval Standard for Firestop Contractors; 2013.
- F. FM (AG) - FM Approval Guide; current edition.
- G. UL (FRD) - Fire Resistance Directory; current edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics.
- D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Installer Qualification: Submit qualification statements for installing mechanics.

1.05 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
 - 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Trained and approved by manufacturer.

2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
3. Verification of minimum three years documented experience installing work of this type.
4. Verification of at least five satisfactorily completed projects of comparable size and type.
5. Licensed by local authorities having jurisdiction (AHJ).

1.06 MOCK-UP

- A. Install one firestopping assembly representative of each fire rating design required on project.
 1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
 2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.
- B. Obtain approval of authorities having jurisdiction (AHJ) before proceeding.
- C. If accepted, mock-up will represent minimum standard for the Work.
- D. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.07 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 1. 3M Fire Protection Products: www.3m.com/firestop.
 2. Hilti, Inc: www.us.hilti.com.
 3. Specified Technologies Inc: www.stifirestop.com.
 4. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com.

2.02 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrate and the items penetrating the firestopping
- C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
- B. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
- C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.04 FIRESTOPPING ASSEMBLIES - MATERIALS

- A. Firestopping at head of walls without penetrations
 1. Tremco, Tremstop Acrylic
 2. 3M FireDam Spray 100

3. STI, AS200
4. Hilti, CFS-SP WB
5. Substitution: See Section 01 60 00 - Product Requirements

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.04 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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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; 2006 (Reapproved 2011).
- 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; 2005 (Reapproved 2010).
- 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.

- E. Sustainable Design Documentation: For sealants and primers, submit VOC content and emissions documentation as specified in Section 01 61 16.

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 hairline 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 Recommendations
 - 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 4 - Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
 - 4. Type 5 - Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
 - 5. 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

Division 08

Openings

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**SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Thermally insulated hollow metal doors with frames.
- E. Sound-rated hollow metal doors and frames.
- F. Hollow metal borrowed lites glazing frames.
- G. Accessories, including glazing.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.
- B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.
- C. Section 09 91 13 - Exterior Painting: Field painting.
- D. Section 09 91 23 - Interior Painting: Field painting.
- E. Division 26 - Electrical
- F. Division 27 - Communications
- G. Division 28 - Electronic Safety

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2018.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.
- F. 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.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.
- H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- I. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- J. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
- K. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- L. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; 2000 (ANSI/DHI A115 Series).

- M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- O. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.
- P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- R. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- S. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2019.
- T. UL (DIR) - Online Certifications Directory; Current Edition.
- U. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

1.07 PROJECT CONDITIONS

- A. Coordinate the work with door opening construction, door frame and door hardware installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com
 2. Curries, an Assa Abloy Group company: www.assaabloydss.com
 3. Mesker, dormakaba Group: www.meskeropeningsgroup.com
 4. Republic Doors, an Allegion brand: www.republicdoor.com.
 5. MPI Custom Steel Doors and Frames: www.metalproductsinc.com
 6. Steelcraft, an Allegion brand: www.allegion.com
 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
 - a. Steel top cap on exterior doors.
 - 4. Door Edge Profile: Manufacturers standard for application indicated.
 - 5. Typical Door Face Sheets: Flush.
 - 6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
 - 7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - a. Prepare doors and frames to receive mortised and concealed door hardware, including cutouts, reinforcing, drilling, and tapping, in accordance with final door hardware and templates provided by hardware supplier. Comply with ANSI A115 Specifications for door and frame preparation".
 - 8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Exterior Doors: Thermally insulated.
 - 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless, Epoxy filled edge (Extra Heavy Duty, 16 gauge).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 - 2. Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
 - 3. Door Thermal Resistance: minimum R-Value of 8.7, minimum, for installed thickness of polyurethane.
 - 4. Door Thickness: 1-3/4 inch, nominal.
 - 5. Top Closures for Outswinging Doors: Flush with top of faces and edges.
 - 6. Weatherstripping: Refer to Section 08 71 00.
 - 7. Verify with Section 08 71 00 - Door Hardware, undercut requirements for exterior doors with thresholds. Standard undercut will not be acceptable for low profile handicap thresholds.

- C. Interior Doors, Non-Fire Rated:
 - 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless Epoxy filled edge (Extra Heavy Duty, 16 gauge).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - 3. Door Thickness: 1-3/4 inch, nominal.
- D. Fire-Rated Doors:
 - 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless Epoxy filled edge (Extra Heavy Duty, 16 gauge).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 - 2. Fire Rating: As indicated on Door Schedule.
 - a. Provide units listed and labeled by UL (Underwriters Laboratories) - UL (BMD).
 - b. Attach fire rating label to each fire rated unit.
 - c. Provide manufacturers certificate that oversized openings have been constructed in accordance with all other applicable requirements for labeled door construction.
 - 3. Core Material: Mineral board.
 - 4. Door Thickness: 1-3/4 inch, nominal.
- E. Sound-Rated Interior Doors:
 - 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless Epoxy filled edge (Extra Heavy Duty, 16 gauge).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 - 2. Sound Transmission Class (STC) Rating of Door and Frame Assembly: STC of 39, minimum, calculated in accordance with ASTM E413, and tested in accordance with ASTM E90.
 - 3. Door Thickness: As required to meet acoustic requirements indicated.
 - 4. Opening Force of Sound-Rated Doors, Non-Fire Rated: 5 lbs, maximum, in compliance with ADA Standards.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. General:
 - 1. Comply with the requirements of grade specified for corresponding door, except:
 - a. Frames for interior openings: ANSI A250.8 Level 3 Doors: 16 gage frames.

- b. Frames for exterior openings: ANSI A250.8 Level 3 Doors: 16 gage frames.
- C. Exterior Door Frames: Full profile/continuously welded type.
 - 1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 3. Frame Finish: Factory primed and field finished.
 - 4. Weatherstripping: Separate, see Section 08 71 00.
- D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
- E. Door Frames, Fire-Rated: Face welded type.
 - 1. Fire Rating: Same as door, labeled.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 3. Frame Finish: Factory primed and field finished.
- F. Sound-Rated Door Frames: Face welded type.
- G. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- H. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.
- I. Transom Bars: Fixed, of profile same as jamb and head.
- J. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- K. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

2.06 ACCESSORIES

- A. Glazing: As specified in Section 08 80 00, factory installed.
- B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- C. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.
- D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.
- F. Closed-cell polyurethane spray foam insulation:
 - 1. Foam Sealant: A one-component, minimal expanding, low pressure-build, flexible polyurethane foam formulated to seal the air gap around door frame and the rough opening. The foam is to expand and generate an effective seal, and will not distort or bow door frames.
 - 2. Foam insulation required in exterior applications between all door head, and jamb.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.

- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Foam insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Install door hardware as specified in Section 08 71 00.
- G. Comply with glazing installation requirements of Section 08 80 00.
- H. Coordinate installation of electrical connections to electrical hardware items.
- I. Install magnetic hold open devices on doors supplied by Division 28.
- J. Touch up damaged factory finishes.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING AND CLEANING

- A. Adjust for smooth and balanced door movement.
- B. Adjust sound control doors so that seals are fully engaged when door is closed.
- C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.
- D. Clean and restore soiled surfaces. Remove scraps and debris and leave site in a clean condition.

END OF SECTION

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. Division 26: Electrical
- E. Section 26 05 83 - EQUIPMENT WIRING.

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; 2020.
- B. 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).
- C. 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).
- D. DASMA 102 - American National Standard Specifications for Sectional Doors; 2018.
- E. ITS (DIR) - Directory of Listed Products; current edition.
- F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.
- G. NEMA MG 1 - Motors and Generators; 2018.
- H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL (DIR) - Online Certifications Directory; Current Edition.
- K. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 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 3720:
www.clopaycommercial.com.
- B. Other Acceptable Manufacturers:
 - 1. Haas Door: haasdoor.com
 - 2. C.H.I. Overhead Doors: www.chiohd.com.
 - 3. Overhead Door Company
 - 4. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 STEEL DOORS

- A. Steel Doors: Flush steel, insulated; follow the roof pitch operating style with track and hardware; complying with DASMA 102, Commercial application.
 - 1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
 - 2. Thermal Performance: Minimum R-value of 17
 - 3. Door Nominal Thickness: 2 inches thick.
 - 4. Air Leakage Rate: Less than 0.40 cfm/sf when tested in accordance with ASTM E283 at test pressure difference of 1.57 psf.
 - 5. Exterior Finish: Factory finished with polyester baked enamel; color as selected by Architect.
 - 6. Interior Finish: Factory finished with polyester baked enamel; color as selected from manufacturers standard line.
 - 7. Glazed Lights: Minimum Three glazed lights per panel, one row; set in place with resilient glazing channel.
 - 8. Electric Operation: Electric control station.
- B. Door Construction:

1. Panels: Foamed in place Polyurethane core construction between exterior and interior steel skins.
 2. Steel Skins: Formed from roll formed commercial quality steel sheet, hot-dip galvanized per ASTM A 924/A 924M and ASTM A 653/A 653M, pre-painted with primer and baked-on polyester topcoat; sections formed to create weather tight tongue-in-groove meeting joint.
 - a. Steel Skin Thickness: Minimum 27 gauge 0.016 inch (0.40 mm) exterior; minimum 27 gauge 0.016 inch (0.40 mm) interior.
 - b. End Stiles: Galvanized steel end stiles, engineered for easy hardware attachment through pre-punched holes. Minimum 18 gauge, 0.045 inch (1.14 mm) thick for single end hinge style and 16 gauge .056 inch (1.42 mm) minimum for double end hinge style.
 - c. Finish: Stucco embossed texture with shallow U ribbed pattern.
 3. Reinforcing: Galvanized and primed steel reinforcement located under each hinge location, pre-punched for hinge attachment.
 4. Handle: High impact polymer step plate/lift handle on bottom panel section.
- C. Glazing: Fully tempered glass; single pane; clear; 1/4 inch overall thickness.
- D. Glazing: Type 1 inch clear tempered glass specified in Section 08 80 00.

2.03 COMPONENTS

- A. 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.

2.04 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. Insulation: Foamed-in-place polyurethane, bonded to facing.
 1. R-value of 18.4.

2.05 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. Interior Doors: NEMA MG 1, 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 250, 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

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**SECTION 08 45 00
TRANSLUCENT WALL AND ROOF ASSEMBLIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall panel system with aluminum frame or composite frame
- B. Beam covers.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between perimeter frame and adjacent construction.

1.03 REFERENCE STANDARDS

- A. AAMA CW-DG-1 - Aluminum Curtain Wall Design Guide Manual; 1996.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

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. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, panel configuration, internal drainage details.
- C. Design Data: Provide framing member structural and physical characteristics, calculations, dimensional limitations.
- D. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.
- E. Samples: Submit two panels, 24 x 24 inch in size, illustrating prefinished aluminum surface, specified panel with skins, glazing materials illustrating edge and corner.
- F. Test Reports: Submit substantiating engineering data, test results of previous tests by independent laboratory which purport to meet performance criteria, and other supportive data. Include the following items for each type and class of panel system:
 - 1. Face sheet color
 - 2. Panel U-factor; NFRC 100.
 - 3. Visible Light Transmittance (VLT), Translucent; NFRC 202 or ASTM E972.
 - 4. Solar Heat Gain Coefficient (SHGC); NFRC 201 calculation.
- G. Installation Data: Special installation requirements.
- H. Manufacturer's Qualification Statement.
- I. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with AAMA CW-DG-1.
- B. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Ohio.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

- D. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle work of this section in accordance with AAMA CW-10.
- B. Protect prefinished aluminum surfaces with wrapping; do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.
 - 1. Puncture wrappings at ends for ventilation.

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 after installation of sealants.

1.09 WARRANTY

- A. Submit manufacturer's written warranty agreeing to repair or replace panel system work which fails in materials or workmanship within five (5) year of the date project completion. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering and defects in accessories, insulated translucent sandwich panels and other components of the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Kalwall; www.kalwall.com
- B. Other Acceptable Manufacturers:
 - 1. Enduro Composites, Inc; Tuff Span Translucent Structural Daylighting Panels: www.endurocomposites.com.
 - 2. Kingspan Light +Air; www.kingspan.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. System Design: Design and size components to withstand dead loads and live loads caused by snow, hail, and positive and negative wind loads acting on plane of panel without damage or permanent set.
 - 1. Design Loads: Calculate in accordance with applicable code.
 - 2. Measure performance in accordance with ASTM E330/E330M, using test load of 1.5 times the design wind pressure and 10 second duration of maximum load.
- B. Deflection: Limit mullion deflection to 3/4 inch with full recovery of glazing materials.
- C. System Assembly: Accommodate without damage to system, components or deterioration of seals; movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; deflection of structural support framing, tolerance of supporting components, shortening of building concrete structural columns.
- D. Light Transmission: approximately 35 percent.
- E. Thermal Resistance of Panel System (Excluding Vision Areas): U factor of .23, approximately.
- F. Expansion/Contraction: System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components.
- G. System Internal Drainage: Drain water entering joints, condensation occurring in framing system, or migrating moisture occurring within system, to the exterior by a weep drainage network.

2.03 COMPONENTS

- A. Translucent Wall System: Structurally reinforced translucent panels, with self supporting framing, shop fabricated, factory prefinished, battens, cap strips, related flashings, anchorage and attachment devices.
- B. Panels Construction: Bonded to both sides of structural extruded grid of pattern as indicated; exposed surfaces of exterior sheet chemically and permanently treated to protect against surface erosion and extreme weather conditions; polyvinyl fluoride film coated.
 - 1. Panel Thickness: 2 3/4 inches (nominal).
 - 2. Light Transmission: approximately [35] percent.
 - 3. Grid pattern: selected by Architect
 - 4. Panel Size: As shown on the drawings.
 - 5. Facing Sheets: translucent crystal interior and crystal exterior.
- C. System Thermal Conductivity:
 - 1. The Panel U-factor by NFRC certified laboratory: 2-3/4" thermally broken grid U-factor of .23
 - 2. Solar Heat Gain Coefficient: 0.39.
- D. Translucent Glass Fiber Insulation
- E. Infill Panel: Internally reinforced, glazing edge sealed permitting internal air movement to glazing space, outside air barrier line , structurally sufficient to support wall fin radiation saddles:
- F. Grid Core
 - 1. Thermally broken I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I- beam shall be no less than 7/16".
 - 2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite.
- G. Thermally broken panels:
 - 1. Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.
 - 2. Minimum CRF of 90 at center of grid cell.
- H. Battens and Perimeter Closure System
 - 1. Closure system: Standard extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
 - 2. ICC Evaluation report (ESR) for Thermally broken systems required
 - 3. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
 - 4. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.
 - 5. Finish: Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected by Architect
- I. Flashings: finish to match translucent panel mullion sections where exposed, secured with concealed fastening method.
- J. Weather Seals: To suit application; non-bleeding; non-staining.

2.04 FABRICATION

- A. Fabricate system components with minimum clearances and shim spacing around perimeter of assembly, and ensure proper installation and dynamic movement of perimeter seals.
- B. Accurately fit and secure joints and corners. Make joints flush and hairline.
- C. Prepare components to receive fabricated anchor devices.

- D. Locate fasteners and attachments to ensure concealment from view.
- E. Reinforce framing members for external imposed loads.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify wall openings and adjoining air barrier and vapor retarder materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install translucent panel system with cells vertical in accordance with manufacturer 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 and align with adjacent work.
- E. Install sill flashings.
- F. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

3.03 FIELD QUALITY CONTROL

- A. Provide the services of the manufacturer's field representative to observe installation and make report.
- B. Independent inspection will be provided under provisions of Section 01 43 00 - Quality Assurance.

3.04 CLEANING

- A. Remove protective material from prefinished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths; remove dirt from corners and wipe surfaces clean.

3.05 PROTECTION

- A. Protect finished work from damage.

END OF SECTION

**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. Sliding doors.
3. Other doors to the extent indicated.

- B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

- C. 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".

- 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. Ohio 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 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 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.

2.2 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. Where specified, provide modular continuous geared hinges that ship in two or three pieces and form a single continuous hinge upon installation.
 2. Manufacturers:
 - a. Hager Companies (HA).
 - b. Pemko (PE).
 - c. dormakaba BEST (ST).

2.3 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges 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 with a 1-year warranty. 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. McKinney (MK) - QC (# wires) Option.
- B. 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. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney (MK) - Connector Hand Tool: QC-R003.
2. Manufacturers:
 - a. McKinney (MK) - QC-C Series.

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:
 - a. Schlage (SC).
 - b. No Substitution.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer's Standard.

C. Keying System: Each type of lock and cylinders to be purchased from Gem City Key Shop, Dayton, OH – p: 937-223-5980.

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.

D. 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).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:
 - a. Sargent Manufacturing (SA) - 8200 Series.

2.6 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. 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.
2. 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.
3. 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.
4. 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.
5. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.

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. Sargent Manufacturing (SA) - PE80 Series.

2.7 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. Cycle Testing: Provide closers which have surpassed 15 million cycles.
- 4. 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.
- 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
- 6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
- 7. 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. Manufacturers:
 - a. Sargent Manufacturing (SA) - 351 Series.

2.8 ARCHITECTURAL TRIM

A. Door Protective Trim

- 1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
- 2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and

not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.9 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. Burns Manufacturing (BU).
 - 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. dormakaba (DO).
 - b. Norton Rixson (RF).
 - c. Sargent Manufacturing (SA).

2.10 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. Reese Enterprises, Inc. (RE).

2.11 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. Securitron (SU) - DPS Series.
- B. Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
2. Manufacturers:
 - a. Securitron (SU) - AQD Series.

C. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
2. Manufacturers:
 - a. Securitron (SU) - AQL Series.

2.12 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.

2.13 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.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. SA - SARGENT
5. SC - Schlage
6. RF - Rixson
7. RO - Rockwood
8. OT - Other

Hardware Sets

Set: 1.0

Doors: [A102a](#), [B109c](#)

1 Continuous Hinge	CFM__HD1-M x PT		PE	
1 Electric Power Transfer	EL-CEPT	630	SU	⚡
1 Fail Secure Exit Device	LC 55 PE8876 WEL	US32D	SA	⚡
1 Rim Cylinder	- match Owner's existing Schlage key system	.626	SC	
1 Surface Closer	351 CPS	EN	SA	
1 Arm Support Bracket	125V	EN	SA	
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	
1 Weatherstrip	2891APK x TKSP - head and jambs		PE	
1 Rain Guard	346C TKSP8		PE	
1 Sweep	345AV TKSP		PE	
1 Threshold	279x224AFGT x MSES25SS		PE	
1 ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK	⚡
1 ElectroLynx Harness	QC-C (power transfer to exit device rail)		MK	⚡
1 ElectroLynx Harness	QC-C (power transfer to exit device lever trim)		MK	⚡
1 Position Switch	DPS-M-BK		SU	⚡
1 Power Supply	AQL_-R8E1 (amperage capacity and		SU	⚡

	outputs as required)	
1 Card Reader	HID Signo Model 20 / 40 (- Provided by Security Contractor)	00

Notes: Door normally closed and locked. Valid use of card reader temporarily unlocks lever trim for access. Push rail equipped with built-in signal switch to be wired for request to exit.
Free egress always permitted.

Set: 2.0

Doors: [A106a](#)

1 Hinge, Full Mortise, Hvy Wt	T4A3386 x QC12	US32D	MK	⚡
2 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP	US32D	MK	
1 Fail Secure Lock	LC RX 8271 LNL	US26D	SA	⚡
1 Surface Closer	351 CPS	EN	SA	
1 Arm Support Bracket	125V	EN	SA	
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	
1 Weatherstrip	2891APK x TKSP - head and jambs		PE	
1 Sweep	345AV TKSP		PE	
1 Threshold	279x292AFGPK x MSES25SS		PE	
1 Repair Kit	QC-R001		MK	⚡
1 Extractor Tool	QC-R002		MK	⚡
1 ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK	⚡
1 ElectroLynx Harness	QC-C (power transfer to lock or electric strike location)		MK	⚡
1 Crimp Tool	QC-R003		MK	⚡
1 Position Switch	DPS-M-BK		SU	⚡
1 Power Supply	AQL_-R8E1 (amperage capacity and outputs as required)		SU	⚡
1 Card Reader	HID Signo Model 20 / 40 (- Provided by Security Contractor)		00	

Notes: Door normally closed and locked. Key override outside retracts latchbolt. Valid use of card reader outside temporarily unlocks outside lever for access. Inside lever function equipped with signal switch for request to exit alarm shunt (REX).
Free egress always permitted.

Set: 3.0

Doors: [A101](#)

1 Continuous Hinge	CFM__HD1-M x PT		PE	
1 Electric Power Transfer	EL-CEPT	630	SU	⚡
1 Fail Secure Lock	LC RX 8271 LNL	US26D	SA	⚡
1 Surface Closer	351 CPS	EN	SA	
1 Arm Support Bracket	125V	EN	SA	
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	
1 Weatherstrip	2891APK x TKSP - head and jambs		PE	
1 Rain Guard	346C TKSP8		PE	
1 Sweep	345AV TKSP		PE	
1 Threshold	279x292AFGPK x MSES25SS		PE	
1 ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK	⚡
1 ElectroLynx Harness	QC-C (power transfer to lock or electric strike location)		MK	⚡
1 Position Switch	DPS-M-BK		SU	⚡
1 Power Supply	AQL_-R8E1 (amperage capacity and outputs as required)		SU	⚡
1 Card Reader	HID Signo Model 20 / 40 (- Provided by Security Contractor)		00	

Notes: Door normally closed and locked. Key override outside retracts latchbolt. Valid use of card reader outside temporarily unlocks outside lever for access. Inside lever function equipped with signal switch for request to exit alarm shunt (REX). Free egress always permitted.

Set: 4.0

Doors: [A107](#)

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	
1 Rim Exit Device, Storeroom	LC PE8804 WEL	US32D	SA	
1 Rim Cylinder	- match Owner's existing Schlage key system	.626	SC	
1 Surface Closer	351 CPS	EN	SA	
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	
3 Silencer	608 / 609		RO	

Notes: Key outside retracts latch bolt. Outside lever rigid.
Free egress always permitted.

Set: 5.0

Doors: [B109a](#)

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1 Rim Exit Device, Passage	PE8815 WEL	US32D	SA
1 Surface Closer	351 CPS	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Smoke / Sound Seal	S88BL - head and jambs		PE

Notes: Passage lever trim.
Free egress always permitted.

Set: 6.0

Doors: [A102](#), [A103](#)

3 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK
1 Office Lock	LC 8205 LNL x LB thumb turn	US26D	SA
1 Wall Stop	RM860	US32D	RO
3 Silencer	608 / 609		RO

Notes: Latch operated by lever either side, unless outside lever is locked or unlocked by key outside or thumb turn inside. Outside lever is unlocked by key outside or thumb turn inside. Latch is retracted by key outside when outside lever is locked. Inside lever always free.

Set: 7.0

Doors: [A108](#)

3 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK
1 Classroom Lock	LC 8237 LNL	US26D	SA
1 Surf Overhead Hold Open	10-X26	652	RF
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
3 Silencer	608 / 609		RO

Notes: Function: Latch bolt by lever either side unless outside lever is locked by key outside. Outside

lever remains locked unless unlocked by key. Inside lever always free for egress.

Set: 8.0

Doors: [A104](#), [A105](#)

3 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK
1 Privacy Lock (w/ indicator)	V20 8265 LNL x LB thumb turn	US26D	SA
1 Surface Closer	351 O - pull side mount	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	RM860	US32D	RO
3 Silencer	608 / 609		RO
1 Coat Hook	RM828	US32D	RO

Notes: Install coat hook at 48" centerline above floor.

Set: 9.0

Doors: [A106b](#), [A106c](#), [A106d](#), [B109b](#)

1 Hardware	- Provided by Overhead Door Section	OT
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END OF SECTION 087100

**SECTION 08 80 00
GLAZING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glazing units.
- B. Glazing compounds.

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 provided as part of storefront assembly.
- E. Section 08 51 13 - Aluminum Windows: Glazing furnished by window manufacturer.

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 2011).
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- E. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.
- F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
- G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.
- H. GANA (GM) - GANA Glazing Manual; 2022.
- I. GANA (SM) - GANA Sealant Manual; 2008.
- J. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.
- K. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.
- L. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.
- M. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

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 size of 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 seen and approved by the Architect.
- C. Thermal Performance Properties:
 - 1. Solar Heat Gain Coefficient : NFCR 200 less than or equal to 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glass Fabricators:
 - 1. Cardinal Glass Industries, www.cardinalcorp.com
 - 2. GGI - General Glass International: www.generalglass.com.
 - 3. Guardian Glass, LLC, www.guardianglass.com
 - 4. Pilkington North America, www.pilkington.com
 - 5. Standard Bent Glass Corp: www.standardbent.com.
 - 6. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
 - 7. Viracon, Inc: www.viracon.com.
 - 8. Vitro Architectural Glass, www.vitroglazing.com

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. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
 1. In conjunction with weather barrier related materials described in other sections, as follows:
- 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.

2.04 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: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - 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): 42 percent, nominal.
 8. Solar Heat Gain Coefficient (SHGC): 28 percent, nominal.
 9. Glazing Method: Dry glazing method, gasket glazing.

2.05 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.

2.06 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch 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 nonpermanent 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

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Division 09

Finishes

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**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 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 07 21 16 - Blanket Insulation: Acoustical Insulation.
- C. Section 07 84 00 - Firestopping: Top-of-wall assemblies at fire rated walls.
- D. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps.
- E. Section 09 22 16 - Non-Structural Metal Framing.
- F. 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 C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- E. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
- F. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- G. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- H. GA-216 - Application and Finishing of Gypsum Panel Products; 2016, with Errata.
- I. 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.
- C. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
 - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

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.
5. Mold Resistant Paper Faced Products:
 - a. American Gypsum Company; M-Bloc Type X.
 - b. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall.
 - c. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard.
 - d. National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board.
 - e. PABCO Gypsum; Mold Curb Plus Type X.
 - f. USG Corporation; USG Sheetrock Brand Mold Tough Panels 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: A.7 and A.1
 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: L bead, as defined in ASTM C840. Products shall be similar to the following:
 1. Marino-Ware; Product L Trim: www.marinoware.com.
 2. Phillips Manufacturing Co; Product L-200 Trim: www.phillipsmfg.com.
 3. Clark Dietrich Building Systems; Product Metal Trim M20B
 4. 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. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- 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 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

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**SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal partition framing.
- B. Framing accessories.

1.02 RELATED REQUIREMENTS

- A. Section 05 41 00 - Structural Metal Stud Framing: Structural load bearing metal stud framing and Exterior wall stud framing.
- B. Section 06 10 00 - Rough Carpentry: Wood blocking within stud framing.
- C. Section 07 21 13 - Board Insulation:
- D. Section 07 84 00 - Firestopping: Sealing top-of-wall assemblies at fire rated walls.
- E. 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; 2014.
- 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. SCAFECO 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. Non-Loadbearing Framing Accessories:

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.
- O. Furring: Coordinate with sound isolation clip spacing and locations. Lap splices a minimum of 6 inches.

3.03 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

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**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 23 - Air Outlets and Inlets: Air diffusion devices in ceiling.
- B. Division 26 - Interior Luminaires: Light fixtures in ceiling system.
- C. Division 27 - Public Address and Music Equipment: Speakers in ceiling system.
- D. 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; 2017.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.
- C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.
- D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2019.

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 6 by 6 inch 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 5 (five) 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 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrong.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com/#sle.
 - 3. Hunter Douglas Architectural; Techstyle Series: www.hunterdouglasarchitectural.com/#sle.
 - 4. USG Corporation: www.usg.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Suspension Systems:
 - 1. Same as for acoustical units.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Rating: Determined in accordance with test procedures in ASTM E119 and complying with the following:

2.04 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.
- B. Acoustical Units - General: ASTM E1264, Class A.

2.05 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: White painted, or as noted on A9 - Material Finish Schedule.

2.06 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
- 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 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.

3.03 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

**SECTION 09 65 13
RESILIENT BASE & ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDE

- A. Resilient Wall Base
- B. Adhesives

1.02 RELATED REQUIREMENTS

- A. 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. Samples: Submit selection and verification samples for finishes, colors, and textures.
- C. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00, for additional provisions.
 - 2. Extra Wall Base: 25 linear feet of each type and color.
 - 3. Obtain Owner's signature acknowledging receipt of extra stock.

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. Roppe Corporation: www.roppe.com
- B. Acceptable Manufacturers:
 1. Burke Flooring: www.burkemercer.com.
 2. Johnsonite, a Tarkett Company: www.johnsonite.com.
 3. 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 Alkalies: 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.(RB)
 - 2. Rope 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: 4 foot sections or rolls (coil)
 - h. Corners
 - 1) Formed by installer on site

2.04 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

**SECTION 09 67 23
RESINOUS FLOORING**

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. Polyaspartic coating system with color chips
- B. Preparation of substrates.
- C. Related accessories

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast in Place Concrete
- B. Section 07 90 05 - Joint Sealers: Joint between base and wall surface.

1.03 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 and colors available.
- C. Samples: Submit two samples, 6 "x 6" inch in size illustrating color and pattern for each floor material for each color specified.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Maintenance Data: Submit manufacturer's care, cleaning, and maintenance guide to include in maintenance manuals.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store in clean, dry, protected location at normal room temperature, according to manufacturer's requirements.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

1.07 WARRANTY

- A. Manufacturer 5-year commercial warranty against product defects for original owner.

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. Polyaspartic Polyurea Flooring:
 - 1. Manufacturer:
 - a. Dur-A-Flex
 - 1) Product: Hybriflex EC Monolithic Decorative Flake Flooring System
 - 2. Acceptable Manufacturers:
 - a. Stonhard
 - b. Key Resin Company
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 HIGH-PERFORMANCE RESINOUS FLOORING

- A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, high-performance, color chip broadcast, resin-based, monolithic floor surfacing designed to produce a seamless floor.
- B. System Characteristics:
 - 1. Color and Pattern: As selected by Architect from manufacturer's full range.
 - 2. Wearing Surface: Textured for slip resistance.
 - 3. Overall System Thickness: 1/8" - 3/16"
- C. Primer / Broadcast Coat:
 - 1. Resin: Polyaspartic Aliphatic Polyurea
 - 2. Formulation Description: High Solids (72 percent solids).
 - 3. Application Method: Roller, Squeegee or Broom.
 - a. Thickness of Coats: 3 Mils. DFT
 - b. Number of Coats: One.
- D. Grout Coat
 - 1. Resin: Polyaspartic Aliphatic Polyurea
 - 2. Formulation Description: 72 percent solids.
 - 3. Application Method: Roller, Squeegee
 - a. Thickness of Coats: 6 Mils. DFT
 - b. Number of Coats: One.
- E. Color Broadcast (2):
 - 1. Application Method: Manual Broadcast
- F. Top-Coats:
 - 1. Resin: Dur-A-Flex Armortop
 - 2. Formulation Description: 72% Solids

2.04 ACCESSORIES

- A. Waterproofing Membrane: for concrete slabs exhibiting elevated moisture vapor emission rates of > 3 lbs over 1000 sq ft in 24 hours or 75 percent relative humidity tested by ASTM F02170.
- B. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer.
- C. Joint Filler Material: Flexible polyurea joint filler or similar product

EXECUTION

3.01 PREPARATION

- A. General: Prepare and clean substrates according to manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with polyaspartic floor coatings.
- C. Roughen concrete substrates as follows:
 - 1. Grind surfaces with an apparatus that abrades the concrete surface to a profile as specified by the manufacturer.
- D. Repair damaged and deteriorated concrete according to polyaspartic floor coating manufacturer's written instructions.
- E. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - 1. Perform relative humidity test using in situ probes, ASTM-F 2170. Proceed with installation only after substrates have a maximum 85 percent relative humidity level measurement.
 - 2. Proceed with installation only after substrates have a maximum relative humidity measurement allowed by the manufacturer or apply to substrates a resin systems moisture vapor primer product if required.
- F. Polyaspartic Materials: Mix components and prepare materials according to manufacturer's written instructions.
- G. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
 - 1. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through polyaspartic floor coating according to manufacturer's written instructions.

3.02 APPLICATION

- A. General: Apply components of polyaspartic floor coating system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of polyaspartic floor coating system to substrate, and optimum inter-coat adhesion.
 - 2. Cure polyaspartic floor coating system components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- B. At substrate expansion and isolation joints, comply with manufacturer's written instructions..
Apply body coat over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.03 CURING, PROTECTION, AND CLEANING

- A. Cure according to manufacturer's instructions.
- B. Protect polyaspartic floor coating system from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by manufacturer.
- C. Clean polyaspartic floor coating system using materials and procedures recommended by manufacturer.

3.04 FIELD QUALITY CONTROL

- A. The right is reserved by the Owner/Architect to have the floor system tested. The cost of this test is at the Owner's expense.
- B. Core Sampling: At the direction of Owner and at locations designated by Owner, take one core sample per 1000 sq. ft. (92.9 sq. m) of resinous flooring, or portion of, to verify thickness.
 - 1. If the core sample show deficiencies additional test are at Contractor's expense.
- C. If test results show the material being used does not comply with the specified requirements, the contractor may be directed to stop work; and remove non complying system; pay for testing; recoat surfaces; and other work deem necessary to correct the unacceptable surfaces.

END OF SECTION

**SECTION 09 68 13
TILE CARPETING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.
- B. Walk-off tile carpet.
- 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 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; 2021.

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. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.
- D. 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

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**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. Non-metallic roofing and flashing.
 - 6. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
 - 7. Marble, granite, slate, and other natural stones.
 - 8. Floors, unless specifically indicated.
 - 9. Ceramic and other types of tiles.
 - 10. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 11. Exterior insulation and finish system (EIFS).
 - 12. Glass.
 - 13. 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 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 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 D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.
- C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.
- D. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.
- E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.
- F. SSPC-SP 1 - Solvent Cleaning; 2015.

- G. SSPC-SP 2 - Hand Tool Cleaning; 2018.
- H. SSPC-SP 6 - Commercial Blast Cleaning; 2007.
- I. SSPC-SP 13 - Surface Preparation of Concrete; 2018.

1.05 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.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and approved by manufacturer.

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 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 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.
- 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.

2.02 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.

2.03 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, primed metal, and _____.
 - 1. Two top coats and one coat primer.

2. 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) PPG Paints Advantage 900 Interior/Exterior Latex, 919-10 Series, Gloss.
 - 3) PPG Paints Pitt-Tech Plus DTM Industrial Enamel, 90-1310 Series, Gloss.
 - 4) Sherwin-Williams Pro Industrial DTM Acrylic, Gloss. (MPI #164)
 - 5) Sherwin-Williams Pro Industrial Multi-Surface Acrylic, Gloss.
 - 6) Substitutions: Section 01 60 00 - Product Requirements.
 - 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.

2.04 PRIMERS

- A. Primers: Provide the primer as required or recommended by manufacturer of top coats.

2.05 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:
 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
 3. Clean concrete according to ASTM D4258. Allow to dry.
 4. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- G. Masonry:

1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 2. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.
- 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.
- J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

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.

3.06 COLOR SCHEDULE

- A. Exposed Concrete: To be Selected by Architect
- B. Steel Lintels: To be Selected by Architect

END OF SECTION

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**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. 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. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 6. Marble, granite, slate, and other natural stones.
 - 7. Floors, unless specifically indicated.
 - 8. Ceramic and other tiles.
 - 9. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
 - 10. Glass.
 - 11. Acoustical materials, unless specifically indicated.
 - 12. 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-Based Materials; 2020.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.
- D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- E. SSPC-SP 2 - Hand Tool Cleaning; 2018.

F. 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.
- 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.
- 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 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 years documented 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.
- 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. Primer Sealers: Same manufacturer as top coats.
- D. 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. 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.
 - 2. 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.
 - 3. 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.
 - 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 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. USGBC LEED Rating System for interior wall and ceiling finishes (all coats), anti-corrosive paints on interior ferrous metal, sanding sealers, other sealers, and floor 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 - 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) PPG Paints Speedhide Zero Interior Latex, 6-5110 Series, Flat. (MPI #143)
 - 4) PPG Paints Speedhide Zero Interior Latex, 6-5310 Series, Eggshell.
 - 5) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat.
 - 6) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Low Sheen. (MPI #144)
 - 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.
 - 4. Primer: As recommended by top coat manufacturer for specific substrate.
- 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): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
 - a. Products:
 - 1) PPG Paints Pitt-Glaze WB1 Epoxy, 16-510 Series, Semi-Gloss. (MPI #141)
 - 2) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #141)
 - 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): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
 - a. Products:
 - 1) PPG Paints Pitt-Glaze WB1 Epoxy, 16-310 Series, Eggshell. (MPI #139)
 - 2) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Eg-Shel. (MPI #139)
 - 3. Top Coat Sheen:

- a. Semi-Gloss: MPI gloss level 5; 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 services located 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) PPG 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)
 - 3) Substitutions: See Section 01 60 00 - Product Requirements

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) PPG Paints Speedhide Masonry Hi Fill Latex Block Filler, 6-15XI. (MPI #4)
 - 3) Sherwin-Williams ConFlex Block Filler. (MPI #4)

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.

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. Concrete:
- F. 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.
 3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. 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.
 2. Prepare surface according to SSPC-SP 2.
- 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 Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

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. 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.
- B. Owner will provide 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

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Division 10

Specialties

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**SECTION 10 11 00
VISUAL DISPLAY UNITS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Markerboards
- B. Tackboards

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 09 91 23 - Interior Painting:

1.03 REFERENCE STANDARDS

- A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).
- B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.
- C. ASTM 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 color charts for selection of color and texture of markerboard, tackboard, tackboard surface covering, 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, natural.
 - 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. Map Rail: One inch (1") high continuous rail with cork insert and end stops
 - b. 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, natural.
 - a. Claridge Products Inc., Series 1
 - b. Perimeter Trim: 1 1/2 inch wide
 - c. Mounting Clips: 2 feet on center top and bottom
- C. Units Made of More Than One Panel: Factory-assembled markerboards and tackboards in a single frame, of materials specified above.

1. Join panels of different construction with H-shaped extruded aluminum molding finished to match frame.
2. Join panels of similar construction with H-shaped extruded aluminum molding finished to match frame.
3. Configuration: As indicated on drawings.
4. Assemble units in one piece without joints, where ever possible. Where required dimensions exceed maximum panel size available, provide 2 pieces of equal length. Assemble to verify fit at factory, then disassemble for delivery and final assembly at project site.

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

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**SECTION 10 14 67
TACTILE SIGNAGE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Room Signs
- B. Restroom Signs

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 A SERIES DRAWINGS FOR SIGNAGE MATERIALS, LAYOUT AND LOCATIONS

2.02 ROOM AND RESTROM SIGNS

- A. Manufacturer:
 - 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 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: Acrylic w/ layered raised Graphic Sign.
 - 1. Material: 1/4" acrylic backer.
 - 2. Graphic Process: Raised letters and braille shall be formed as an integral part of the sign face. 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. Colors: The architect will select from manufacturers standard colors for background and text. Characters, symbols and text shall contract with background and and have a non-glare finish .
 - 5. Mounting: Silicone Adhesive with vinyl double faced tape 1/32 inch thick all edges.

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.

3.04 SCHEDULES

- A. Room Signs see drawings location of signs.

END OF SECTION

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**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.

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 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

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, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Mirror Glass: Tempered glass, Type I, Class 1, Quality q2 (ASTM C 1036), with silvering, copper coating, and suitable protective organic coating to copper backing in accordance with GSA CID A-A-3002.
- F. Adhesive: Two component epoxy type, waterproof.
- G. 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: 1-1/4 inch outside diameter, minimum 0.05 inch 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. TA3.1; Toilet Paper Dispenser (Owner Furnished, Contractor Installed)
 1. Surface-mounted multi-roll toilet tissue dispenser shall be type-304 stainless steel with all-welded construction, including dispensing mechanism, inner housing and cam; exposed surfaces shall have satin finish. Front of toilet tissue dispenser door shall be drawn, one-piece, seamless construction. Door shall equipped with a tumbler lock keyed like other accessories
 2. Unit shall dispense two standard-core toilet tissue rolls up to 5-1/4" (133mm) diameter.
 3. Extra roll shall automatically drop in place when bottom roll is depleted.
 4. Unit shall be equipped with two theft-resistant, heavy-duty, one piece, molded ABS spindles.
 5. Product: B-2888 manufactured by Bobrick.
- E. TA3.3; Toilet Paper Dispenser (Owner Furnished, Contractor Installed)
 1. Jumbo-roll toilet tissue dispenser door and cabinet shall be type-304 stainless steel with satin-finish: door shall be 18 gauge (1.2mm); cabinet shall be 20 gauge (1.0mm). Cabinet shall be equipped with a tumbler lock keyed like other accessories.
 2. Door shall have a wide viewing slot to reveal toilet tissue supply inside cabinet.
 3. Dispensing mechanism shall be constructed of high-impact ABS and shall accommodate two toilet tissue rolls up to 10" (255mm) diameter with 3" (75mm) diameter core and be equipped with a sliding access panel that exposes one roll at a time.
 4. Spindles shall be convertible in the field to dispense 2-1/4" (55mm) diameter core rolls by removing outer spindles.

5. Product: B-2892 manufactured by Bobrick.
- F. 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.
- G. TA5.1; Soap Dispenser (Owner Furnished, Contractor Installed)
 1. Surface-mounted soap dispenser shall be type-304 stainless steel with satin-finish. Corrosion-resistant valve shall dispense commercially marketed all-purpose hand soaps.
 2. Valve shall be operable with one hand and with less than 5 pounds of force (22.2 N) to comply with barrier-free accessibility guidelines (including ADAAG in the U.S.A.).
 3. Container shall be equipped with a clear acrylic refill-indicator window; a locked, hinged stainless steel lid for top filling; and shall have a capacity of 40-fl oz (1.2-L).
 4. Unit shall have concealed, vandal-resistant mounting.
 5. Product: B-2111 manufactured by Bobrick.
- H. TA6.1 Paper Towel Dispenser: (Owner Furnished, Contractor Installed)
 1. Surface-mounted roll-paper-towel dispenser with durable, high-impact, dark translucent grey resin door with high-gloss finish on exposed surfaces and durable, high-impact, light grey resin housing with matte finish. Door shall be secured to housing with two stainless steel hinge pins and keyed lock. Door shall have lock which is opened with removable key.
 2. Towel mechanism accommodates up to 8" (205mm) wide, 8" (205mm) diameter, non-perforated paper towel rolls. Towel mechanism dispenses one 12" (305mm) length of towel per pull. Automatic transfer shall dispense stub roll up to 3-1/2" (90mm) diameter before new roll is dispensed. Equipped with paper towel feed wheel for use in filling the dispenser, for user to advance paper.
 3. Paper towels are dispensed with pull force of less than 5 pounds (22.2 N) to comply with accessible design guidelines (including ADAAG in U.S.A.).
 4. Product: B-72860 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

**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

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. Acceptable Manufacturers:
 - 1. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 HIGH - SECURITY KEY LOCK BOX

- A. Mounting Type: Recessed Mounted #3275
- B. Color: Black
- C. Capacity: 10 keys and Key Fob.
- D. Cabinet Construction: 1/4 inch plate steel fully welded.

- E. Exterior Dimensions:
 - 1. Surface Mount 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
- F. Door Construction: 1/2 inch thick steel.
- G. Weather-Resistant door gasket.
- H. Stainless Steel door hinge.
- I. 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.

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

**SECTION 10 44 00
FIRE PROTECTION SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. 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 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.

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 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.

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 CLEANING

- A. Clean all surfaces.
- B. Upon completion, remove surplus and excess materials, rubbish, tools and equipment.

3.04 PROTECTION

- A. Protect installed products from damage during construction in accordance.

END OF SECTION

**SECTION 10 44 16
FIRE EXTINGUISHERS**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Provision of fire extinguishers as shown and specified. Work includes:
1. 40-B:C dry chemical type fire extinguishers;
 2. Mounting brackets and accessories; and
 3. Lockable cabinets.

1.02 SUBMITTALS

- A. Refer to Section 01 33 00 for additional submittal requirements.
- B. Submit manufacturer's product data and specifications.
- C. Submit manufacturer's fire extinguisher operation and maintenance data. Include test, refill or recharge schedules, procedures, and recertification requirements.

1.03 QUALITY ASSURANCE

Provide only new portable fire extinguishers fully loaded, tested, UL and FM labeled and listed, and ready for use.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Manufacturer:

1. Larsen's Mfg. Co.;
2. J.L. Industries, Div. of Activar Inc.; or
3. Fire Tech.

2.02 EXTINGUISHERS

Fire extinguishers: Larsen's Model MP6 red enameled finish, heavy duty steel cylinder, UL rated and FM approved. Multi-purpose dry chemical type for Class B and C fires, 6 lb. charge weight, UL rated 3A-40B:C, pull pin, upright, squeeze grip operation with visual pressure gauge, and hose.

2.03 WALL BRACKETS

Mounting brackets: Provide manufacturer's standard plated finish heavy duty mounting brackets for surface mounted fire extinguishers. Provide proper size and type for capacity of extinguishers indicated.

2.04 CABINETS

Cabinets shall be lockable with break-glass feature, and mirrored finish on inside of glass. Cabinet shall be constructed of 12 gauge steel painted red with locking door, keys, hinges, and mirrored glass. Furnish with sign affixed to door.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install fire extinguishers where indicated in accordance with manufacturer's recommendations. Mount at heights specified.
- B. Securely anchor brackets to substrate with toggle bolts or expansion anchors, as appropriate. Lead, wood, and plastic plugs and fasteners are not acceptable.

END OF SECTION

Division 12

Furnishings

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**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. Casework Grade: Provide plastic laminate faced casework complying with the referenced quality standard and the following grade:
 - 1. Grade: custom.
- D. 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. 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. High Pressure decorative laminate complying with NEMA LD3, Grade GP-28
 - 2. High Pressure decorative laminate complying with NEMA LD3, Grade CL-20
 - 3. High Pressure decorative laminate complying with NEMA LD3, Grade BK-20
- C. Edge Banding for Plastic Laminate:
 - 1. Rigid PVC extrusions, through color with satin finish, 3 mm thick at door and drawer fronts, 1 mm thick elsewhere.
- 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
 - 2. Color: as selected from manufacturer's standard. - Brushed 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. Trays and Bins: High impact polystyrene or polyethylene formed trays and bins shall be provided where indicated by model numbers. Trays and bins shall be suspended on welded wire powder coated rack system. System includes side suspension rack uprights with top and bottom horizontal guideways to avoid inadvertent tip out.
- G. 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.
- H. 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.

I. 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.

J. Chain Stop:

1. Manufacturers standard, install on all doors that will hit casework components or adjacent walls

K. Label Holder: Holder shall be 2 inches wide by 3/4 inches high anodized aluminum.
Attachment: Adhesive

L. Sliding Door Track: Track shall be a double channel rigid PVC extrusion at both top and bottom of doors.

1. Color: as selected from manufacturer's standard.

M. Grommets: 60 mm diameter two piece round with break away tab corner.

1. Color: as selected from manufacturer's standard.

N. 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. Countertops - wet areas:
 1. Core: 1 inch exterior grade veneer core plywood or phenolic resin particleboard
 2. Surface: GP50 balanced with backing sheet
 3. Edge: 3 mm PVC
 4. Construction/Joinery: Apply silicone sealant to joint between HPL top and backsplash. Field joints greater than 48 inches and greater than 48 inches from end
 5. Hardware: Grommets as indicated on drawings
- C. Countertops:
 1. Core: 1 inch particleboard
 2. Surface: GP50 balanced with backing sheet
 3. Edge: 3 mm PVC
 4. Construction/Joinery: Apply silicone sealant to joint between HPL top and backsplash. Field joints greater than 48 inches and greater than 48 inches from end
 5. Hardware: Grommets as indicated on drawings
- D. 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
- E. 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

- F. 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.
- G. 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.
- H. 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 otherwise.
 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 front 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 concrete 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

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**SECTION 12 51 00
OFFICE FURNITURE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnishing, Furniture and Equipment covered by this section, accompanying drawings, and schedules
- B. Provide furnishings, furniture, equipment and accessories shown on the drawings and schedules including delivery to the building, uncrating, assemble, set in place and made ready for use.

1.02 ALTERNATIVES

- A. See Section 01 2300 - Alternatives, for product alternatives affecting this section.

1.03 RELATED SECTIONS

- A. Division 26 - Electrical
- B. Division 27 - Communications

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, and architect.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. If Contractor's Shop Drawings or its submittals do not contain sufficient information, and the Architect must perform more than two (2) reviews with respect to any submittal, the Contractor shall pay additional costs and expenses incurred by the Owner as a result of such additional reviews by the Architect, and the Owner may withhold from sums due or coming due the Contractor's amounts to cover such additional costs and expenses.
- C. Certification: Products must comply with The Consumer Product Safety Improvement Act (CPSIA) which regulates testing requirements for children's products. Section 102 of CPSIA provides regulations for lead in paint and similar surface coatings. Upon request, manufacturers must submit a third party testing and certification complying with Section 102 of the CPSIA with the requested bid.
- D. Samples: Provide three (3) complete color samples of each component for Architect's selection. Selection shall be made from manufacturer's full line of standards if not indicated in the Contract Documents.
- E. Furnishing Schedule: Detailed listing of each option, accessories and similar data of each item to be installed. Use loose furnishing schedule item numbering scheme as included in the Contract Documents.
- F. Product Data: Manufacturer's catalog literature for each item, marked to clearly show products and accessories to be furnished for this project and showing image of each item.
 - 1. The Data shown on the submittals shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to communicate materials and equipment which the contractor proposes to provide for each item.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 1. Warranty date to start on the day of Substantial Completion.

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.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products to meet project schedule.
- B. Contractor is responsible for delivery to the jobsite including but not limited to, receiving, unloading, storing, handling and protecting.
 - 1. If items are drop shipped, the contractor must be present to unload shipment.
 - 2. The Owner will not be responsible for deliveries related to the construction or operations of the contractor. The Owner cannot not sign delivery forms for the contractor.
- C. Do not deliver furniture to project until dry and heated storage space is provided and all wet operations in the space are completed. Storage space shall be ventilated, protected from weather, with a relative humidity range of 20 to 50 percent.
- D. Protect finished surfaces from soiling and damage during handling and installation.
- E. Protect the Owner's property and that from other contractors from injury or loss arising in connection with this work. Repair, replace damage injury or loss.

1.08 PROJECT CONDITIONS

- A. Furniture supplier shall be responsible for quantities shown on the drawings and schedules.
- B. Coordinate work specified or other work that may arise incidental to the completion of the project.
- C. Coordinate furniture installation with size, location and installation of service utilities.
- D. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.09 WARRANTY

- A. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Tipp City Exempted Village School District name and registered with manufacturer.
- B. Provide manufacturer's standard warranty for each product.
 - 1. Warranty Period: As indicated in the furnishings schedule.

PART 2 PRODUCTS

2.01 FURNITURE FURNISHING AND EQUIPMENT

- A. Equipment shown on the drawings and scheduled are used as a basis for identification, configuration, size and quantity.
- B. The catalog numbers of the manufacturer listed are intended to include a complete and total assembly as the catalog number indicates in the current catalog. The item shall be provided complete with hardware, accessories, features and components.
- C. The intent of the schedule is to establish type, continuity, standards and standards of quality. The furnishings are to be provided with accessories required (bolts, screws, plates, available options etc.) to comply with the intent of the schedule and the drawings.

2.02 MANUFACTURER

- A. Furniture from other approved Manufacturers shall be acceptable provided that the furniture meets or exceeds the configuration, arrangement, design, material quality, joinery and surfacing of that specified and shown on the drawings.

1. 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.
2. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that job site and conditions under which the work is to be performed. Notify the Architect of any unsatisfactory conditions.
- B. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install furnishings, furniture and equipment in each room identified on the schedule.
 1. Set furnishings, furniture and equipment in locations shown on the plans. Items are not identified by item number on the plans, however the general shape and configuration of the items are shown for reference purposes.
- C. Use anchoring devices to suit conditions and substrate materials encountered.
- D. Set furnishings, furniture and equipment items plumb and square, securely anchored to building structure if required.
- E. Repair minor abrasions and imperfections in finishes with a coating that matches factory-applied finish; replace units that cannot be repaired to unblemished appearance.

3.03 DEMONSTRATION

- A. Demonstrate proper operation of equipment to Owner's designated representative.
- B. At completion of work, provide qualified and trained personnel to demonstrate operation of each item of equipment and instruct in operating procedures and maintenance.
 1. Test equipment prior to demonstration.
- C. Individual Performing Demonstration: Fully knowledgeable of all operating and service aspects of equipment.
- D. Obtain Owner's signature acknowledging demonstration of equipment.

3.04 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Contractors shall provide daily cleanup and removal of rubbish/refuse resulting from their operations.
- C. Do not burn or bury rubbish and waste material on project site.
- D. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- E. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in strom or sanitary drains.
- F. Repair damage to the building caused by installation. Contractor to hire contractor or subcontractor who initially executed the work to repair damage.

3.05 FIELD QUALITY CONTROL

- A. Defective workmanship or damaged components shall be corrected, repaired, or replaced as determined by the Architect.

3.06 ADJUSTING

- A. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

3.07 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
 - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Repair or replace damaged or incorrectly finished items, including but not limited to, scratches, dents, warps, discoloration, non-functional parts etc.
- C. Use cleaning materials that are nonhazardous.
- D. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces,
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Protect installed furniture and equipment from subsequent construction operations.
- G. Keep premises free of accumulation of waste material during progress of the work and at completion, leave premises clean and ready for occupancy or use.

3.08 PUNCH LIST

- A. The contractor shall begin corrective activities within 7 days of receipt of punch list.
- B. The contractor shall complete items on the punch list within a 21 day period.
 - 1. If the contractor fails to complete the work within 21days, the Owner at his discretion may perform the work or have others perform the work and the cost of the work shall be charged against the contractor.

3.09 TEMPORARY EQUIPMENT

- A. Temporary equipment shall be supplied when:
 - 1. Specified equipment was not delivered according to the project schedule
 - 2. Installed equipment was deemed unusable by the Architect
 - 3. Items are required to be removed from site for repair
- B. Temporary items shall be in serviceable condition and serve the function of specified equipment.

3.10 SCHEDULES

- A. Refer to drawings for locations and quantities of the following items.
- B. Basis of Design Specifications. Refer to se
 - 1. LF1: Guest Chair
 - a. Manufacturer: HON
 - b. Product: Motivate 4-Leg Chair, Stacking with Arms
 - c. Seat / Back Finish: Poly (one piece)
 - d. Seat Color: To be Selected from Manufacturer's Standards
 - e. Frame Finish: Black
 - f. Casters for Hard Surface Flooring
 - 2. LF2: Rectangular Table
 - a. Manufacturer: HON
 - b. Product: Motivate Training Tables,
 - c. Dimensions: 24" x 60" Rectangular, Fixed
 - d. Standard Glides
 - e. Table Top Finish: High Pressure Laminate, Select from Manufacturer's standards

- f. Edge Finish: 3mm PVC to match table top laminate
- 3. LF3: Paper Slot
 - a. Manufacturer: Deflecto
 - b. Product: EX Link Sustainable DocuPocket 93204
 - c. Color: Black
 - d. Dimensions: 13"W x 7"H x 4"D

END OF SECTION

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Division **13**

Special Construction

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**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 exterior walls in garage area.
 - 3. Roof system consists of the manufacturer's standard standing-seam 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. Wall accessories, including:
 - 1. Windows and translucent wall panels
 - 2. Service doors
 - 3. Louvers
 - 4. Wall openings trim
- F. 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

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

- B. AAMA/NWWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association; 1997
- C. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 1998 (Revision and Redesignation of ANSI/SDI 100-91).
- D. SDI 116 - Standard Test Procedure and Acceptance Criteria for Rate of Air Flow Through Closed Steel Door and Frame Assemblies; Steel Door Institute; 1979.

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 and 480 at brick veneer, 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.

- 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 Buildings Company
 - 2. A & S Building Systems, Inc; Division of NCI Building Systems, L.P.
 - 3. American Steel Building Co., Inc.
 - 4. Butler Manufacturing Co
 - 5. Chief Buildings
 - 6. Ceco Building Systems
 - 7. Corle Building Systems
 - 8. Kirby Building Systems
 - 9. Nucor Building Systems
 - 10. Star Building Systems
 - 11. VarcoPruden Buildings

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 expandable end walls for possible future additions, consisting of load-bearing end-wall and corner columns and rafters.
- 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: Manufacturer's standing-seam metal roof panel equal to Chief Buildings "MVP" panel, with kynar 500 painted finish.
- H. Exterior Wall System: Manufacturer's standard tapered-rib, exposed-fastener metal wall panels with field-installed insulation.

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 **10 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 cranes and materials-handling 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/240 for roof snow load.
 - b. Purlins and Rafters: Vertical deflection of L/240 (under Live Load, Snow Load, or Wind Load) and L/240 under Dead Load plus Live Load.
 - c. Girts: Horizontal deflection of L/240 at metal panel and L/480 at brick veneer.
 - d. Metal Roof Panels: Vertical deflection L/180 of the span.
 - e. Metal Wall Panels: Horizontal deflection of L/240 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 1/500 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. U-Factor of .047

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 : Full frames with endposts, for future expansion.
- 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 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.
- 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. Door Headers and Jambs: Zee- or Cee-shaped; depth as required; with minimum yield strength of 55,000 psi.
- K. Sag Angles and Bridging: Steel angles, with minimum yield strength of 36,000 psi.
- L. 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.
- M. 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.
- N. 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.
- O. Package building components for shipping by common carrier.

2.05 METAL ROOF PANELS

- 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 to match Owners existing metal roof system.
 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.
- C. Ridge Assembly for High End of Slopes: SSR Ridge; draw-formed aluminum seam caps factory-attached to SSR ridge panels that are seamed together along the center of the ridge, utilizing only one weathersealed joint and providing a true expansion joint for panel movement.

2.06 METAL WALL PANELS

- A. **Tapered-Rib-Profile, Metal 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, 26 GA, 50,000 psi (min.).
 - a. Panel Finish: White Pigmented Polyester
 - 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 Chief Buildings "CS Panel"
- B. 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.

2.07 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. **Roof Vapor Barrier Liner Fabric**:: Basis of Design - Simple Saver System with OSHA compliant through fall protection.
 - a. Syseal FP type woven, reinforced, high density Polyethylene yarns coated on both sides with a continuous white polyethylene coatings, as follows:
 - 1) Product complies with ASTM C 1136, Types I through Type VI.
 - 2) Perm rating: 0.02 for fabric and for seams in accordance with ASTM E 96.
 - 3) Flame/Smoke Properties: 25/50 in accordance with ASTM E 84. Self-extinguishes with field test using matches or butane lighter.
 - 4) Ultra violet radiation inhibitor to minimum UVMAX rating of 8.
 - b. Size and seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
 - c. Provide with factory double, extrusion welded seams. Stapled seams or heat-melted seams are not acceptable.
 - d. Factory-folded to allow for rapid installation.
 - e. Color: White
 2. **WALL INSULATION** Basis of Design - Simple Saver System Double Layer
 - 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. Insulation thickness: Double layer 8" to fill girt cavity and second layer to be continuous and compressed by the exterior metal panel on the exterior of the wall girts; Maximum U-factor of .047.
 3. **ROOF INSULATION**
 - a. Facing: Heavy duty, white (unless otherwise noted) metallized polypropylene, 0.0015 inch thick polypropylene film, with polyester fabric backing reinforcing; permeance 0.02 perms. Composite of fiberglass and polyester 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 / UL 723
 - b. Formaldehyde-free fiberglass batt or fiberglass blanket complying with ASTM C 991 Type 1 and ASTM E 84 with a thermal resistance and thickness as follows:
 - c. R-36; 11-1/2 inches, 8 inches bottom between purlins and 3 inches top layer insulation laid perpendicular up over thermal break and purlins to get compressed by metal roof panel.
 - 1) If contractor elects to use 10 inch purlins, it is their responsibility to adjust the overall thickness of the insulation to fill then entire cavity between the bottom

side of the purlin to the bottom side of the standing seam metal roof.

- d. Provide insulation in proper length rolls to fit tightly between purlins.
 - e. Basis of Roof Insulation Design "Thermal Design, Simple Saver System"
 - 1) Substitutions: See Section 01 60 00 - Product Requirements.
 - f. Vapor Barrier Lap Sealant: Solvent-based, Simple Saver polyethylene fabric adhesive.
 - g. Vapor Barrier Tape: Double-sided sealant tape 3/4 inch wide by 1/32inch thick.
 - h. Vapor Barrier Patch Tape: Single-sided, adhesive backed sealant tape 3 inches wide made from same material as Syseal type liner fabric.
 - i. Thermal Breaks: Thermal break shall be 1 inch thick x 24 inch long x 4 inch wide Snap-R snap on thermal block.
 - j. Straps:
 - 1) 100 KSI minimum yield tempered, high-tensile-strength steel.
 - 2) Size: Not less than 0.020 inch thick by 1 inch by continuous length.
 - 3) Galvanized, primed, and painted white.
 - k. Fasteners:
 - 1) For light gage steel: #12 by 3/4 inch plated Tek 2 type screws with sealing washer, painted to match specified color.
 - 2) For heavy gage steel: #12 by 1-1/2 inch plated Tek 4 type screws with sealing washer, painted to match specified color.
- B. Thermal Blocks: High density, 3/4 inch thick extruded polystyrene, for installation over the purlin.

2.08 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.
- B. Windows: Extruded aluminum frames with extruded aluminum sash of 6063-T5 alloy, complying with AAMA/NWWDA 101/I.S.2 performance and testing requirements for Grade R.
- 1. Screens: 18 by 16 fiberglass mesh.
 - 2. Finish on all exposed areas of aluminum windows and fins: Baked enamel complying with AAMA 603.8.
 - 3. Color: Manufacturer's standard bronze.
 - 4. Type: Horizontally sliding.
- C. Service Doors:
- 1. Type: Full flush.
 - 2. Frames: ANSI A250.8, modified drywall type, 4-3/4 inches jamb depth minimum 16 gage steel; self-framing and self-flashing.
 - 3. Hardware Reinforcements: Comply with ANSI A250.8; locate so that door and frame are non-handed.
 - 4. Finish: Two coat baked on paint on all exposed surfaces, apply after cleaning and chemical treatment for corrosion resistance and paint adhesion; manufacturer's standard bronze color.
 - 5. Weatherstripping: At jambs, head and sill, complying with water and air resistance requirements of SDI 116.
 - 6. Hardware:

- a. One key in-knob cylindrical lockset per opening except on doors indicated to receive mortise lock.
 - b. One mullion and one pair surface bolts per double door opening.
 - c. Three full mortise hinges per leaf, one with non-removable pin.
- D. Louvers: 18 gage galvanized steel, self-framing, self-flashing with integral head gutter, with paint finish.
- 1. Screen: Exterior mounted, removable insect screen.
 - 2. Minimum Free Area: 65 percent.
 - 3. Color: Manufacturer's standard bronze.
- E. Wall Openings: Cold-formed sheet metal framing concealed with trim; same color as wall panels.

2.09 ROOF ACCESSORIES

- A. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, 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
- I. Ridge Ventilators: 10 feet long, 26 gage Galvalume, with damper with chain and worm gear operator and bird screen, and base configured to match roof panel.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: The Owner or the Architect of Record will employ/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.

2.11 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.

2.12 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 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. Pre-drill 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 Roof Insulation: Comply with the following installation method and as instructed by manufacturers instructions:
 1. Unpack, and shake to a thickness exceeding the specified thickness.
 2. Ensure that cavities are filled completely with insulation.
 3. Place on the vapor barrier liner fabric without voids or gaps.
 4. Install first 2 layers of unfaced insulation so that it fits snugly between purlins.
 5. Snap on thermal block on top of purlins continuous the length of purlin.
 6. Install third layer of unfaced insulation over purlin so that it is perpendicular to the first two layer.
 7. Insulation shall fill the entire cavity between the bottom side of the purlin to the bottom side of the metal roof panel.
 8. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
- E. 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 employ/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

Division 22

Plumbing

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**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. Refer to Section 07 8400 - Firestopping. Electrical Contractor shall provide submittals for fire stopping based on Section 07 8400.
- C. Refer to Division 26, Electrical Specifications, and to the requirements stated therein applicable to the Mechanical Work, where coordination of trades is covered.
- D. 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.
- E. 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. 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 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. 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 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.
- 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.

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

**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. Terrice.
 - 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 Terrice #735-2 or approved equal Brass Needle Valve 1/4 inch NPT for positive shut-off. #872-2 or approved equal Terrice Pressure Snubber 1/4 inch NPT must be installed wherever pulsation occurs.

2.02 GAS PRESSURE GAUGES

- A. Manufacturers:
 - 1. Terrice.
 - 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 Terrice #760 or approved equal Brass Needle Valve 1/4 inch NPT for positive shut-off. #872-1 or approved equal Terrice Pressure Snubber 1/4 inch NPT must be installed wherever pulsation occurs.

2.03 STEM TYPE THERMOMETERS

- A. Manufacturers:
 - 1. Miljoco.
 - 2. Terrice.
 - 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. Terrice.
 - 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

**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. Section 09 91 23 - Interior Painting: Identification painting.
- B. 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. 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. NG - Natural Gas
 - 4. AIR - Compressed Air

- 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

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**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. 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

**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. Section 07 84 00 - Firestopping.
- B. 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.

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: 3/4 inch.
 - 2) Pipe Size Range 1 1/2 inch and above:
 - (a) Thickness: 1 inch.
 2. 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: 3/4 inch.
 - 2) Pipe Size Range: 1 1/2 inch and above:
 - (a) Thickness: 1 inch

END OF SECTION

**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. Natural Gas.
 - 4. Flanges, unions, and couplings.
 - 5. Pipe hangers and supports.
 - 6. Valves.
 - 7. Check.
 - 8. Relief valves.
 - 9. 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. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers; 1968.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- C. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2019.
- D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2021.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- F. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- G. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

- H. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- I. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).
- J. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; 2001 (Reapproved 2014).
- K. AWWA C651 - Disinfecting Water Mains; 2014.
- L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.
- M. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- N. NSF 372 - Drinking Water System Components - Lead Content; 2022.
- O. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- P. ANSI/ASME Section 9, AWS D10.9 and D1.1 National Certified Pipe Welding Bureau.
- Q. 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. 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.
- B. 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.

2.02 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: 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.
 - 4. Solders and flux: ASTM B828, ASTM B813, containing 0.2% lead or less.
- B. 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.

2.03 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) Viega: MegaPress
 - 2) Apollo: PowerPress
 - 3) 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. Provide 1/2 inch elastomeric insulation around all gas piping in walls and through floors.
- D. All gas piping shall be accessible.

2.04 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.

2.05 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.

2.06 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. 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.

2.07 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. 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.

2.08 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.

2.09 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. Kitz.
 9. 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.

2.10 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. Kitz.
 7. 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 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

2.11 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. 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.

2.12 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.

2.13 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.

2.14 STRAINERS

A. Manufacturers:

1. Mueller.
2. Armstrong International, Inc.
3. Nibco, Inc
4. Sarco.
5. Hoffman.
6. Metalflex.
7. Conbraco Industries / Apollo Valves
8. 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. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space. Coordinate all installation with all other trades.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves are not exposed. Coordinate size and location of access doors with Section 08 31 00.
- I. Establish elevations of buried piping outside the building to ensure not less than 4 ft of cover for domestic water piping.
- J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly and 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.

- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- L. Provide support for utility meters in accordance with requirements of utility companies.
- M. Excavate in accordance with Section 31 23 16.
- N. Install valves with stems upright or horizontal, not inverted. All valve handles shall be easily accessible.
- O. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood or turn down elbow with insect screen.
- P. Install water piping to ASME B31.9.
- Q. Test all gas piping per NFPA 54.
- R. Unions and valves are not permitted in the gas piping in a return air plenum.
- S. Provide 1/2" elastomeric insulation around all piping in walls and through floors.
- T. 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.
- U. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- V. Sleeve pipes passing through partitions, walls and floors.
- W. 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.
- X. 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

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**SECTION 22 10 06
PLUMBING PIPING SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floor drains.
- B. Cleanouts.
- C. Hose bibbs.
- D. Hydrants.
- E. Backflow preventers.
- F. Water hammer arrestors / Shock Absorbers.
- G. Mixing valves.
- H. Trap Primers.
- I. Trap Seal Protection Devices
- J. Sumps and Interceptors.
- K. 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. DIN EN 1433 - Drainage Channels for Vehicular and Pedestrian Areas - Classification, Design and Testing Requirements; Marking and Evaluation of Conformity; 2005.
- G. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- H. NSF 372 - Drinking Water System Components - Lead Content; 2022.
- I. 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. 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.
- C. Trench Drain (TD)
 - 1. High density polyethylene structural composite drain channel with bottom slope. Provide with epoxy coated steel frame. All sections shall include integral top frame, interlocking ends and radiused bottom. Combination tie-down/leveling devices as required.
 - 2. Grate: Epoxy Coated Ductile Iron Grate - Heavy Duty Class C
 - a. Reference Standard: DIN EN 1433
 - 3. Refer to schedule on drawings for length of drains required.
 - 4. Provide with quantity two fiberglass trench shovels designed specifically for use with the trench drain system without damaging the interior walls of the trench. Shovel blade shall be laminated using same glass-filled polyester fiberglass material found in the trench drain system. Equal to Zurn model Z-812.

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. Heavy Duty cast iron, inside caulking, with adjustable heavy duty cast round tops.
- 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. ASSE 1019; self-draining type with chrome plated wall plate hose thread spout, handwheel, and integral vacuum breaker.
 2. 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, and integral 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 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.

2.07 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.

2.08 TRAP PRIMERS

- A. Manufacturers:
1. Precision Plumbing Products; Model Oregon #1
 2. Jay R. Smith Manufacturing Company.
 3. Watts Regulator Company.
 4. Zurn Industries, Inc.
 5. Wade.
 6. Josam.
 7. MIFAB
 8. Substitutions: See Section 01600 - Product Requirements.
- B. Trap Primers
1. Diaphragm operated primer which delivers fresh water to floor drains by sensing a pressure drop in water line.
 2. Provide trap primer for floor drains as required by State and Local codes. Connect floor drain to a flush valve or solenoid valve. Extend 1/2" piping from trap primer to floor drain connection below finish floor. Provide distribution manifold for multiple floor drain connections to one trap primer.

2.09 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. 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.

2.10 SUMP AND INTERCEPTORS

- A. Manufacturers:
1. ACO International; Model _____.
 2. Jay R. Smith Manufacturing Company; _____: www.jayrsmith.com.
 3. Zurn Industries, LLC; _____: www.zurn.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Oil Interceptors:
1. Construction:
 - a. Chemical Resistant High Density Polyethylene.
 - b. Alternate Material: High Strength, mild carbon steel to ASTM specifications and coated both inside and outside with high solids polyurethane.
 - c. Ratings: The Grease Interceptor shall meet the IAPMO standards for sanitary systems and ASSHTO structural requirements. It shall be H-20 load rated when installed in accordance with manufacturer's installation details.
 - d. Rough-in: Refer to detail on drawings.
 - e. Cover: Heavy duty, Traffic rated cover equal to Neenah R-6462-EH.
 - f. Unit Rating: Refer to drawings for unit size and capacity.
 - g. Anchor: Manufacturer to provide required deadman and anchor straps as required for anchoring of tank.

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 City of Tipp City 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 lavatories, sinks, service sinks, washing machine boxes, and flush valves serving water closets and urinals. All water hammer arrestors shall be accessible above the ceiling.
- H. 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.
- I. Install mixing valves at +5'-0" above finished floor.
- J. Install lavatory thermostatic mixing valves serving single lavs directly below the lavatory. Locate as high as possible below lavatory.
- K. Install lavatory thermostatic mixing valves serving multiple lavs above lay-in ceiling. Locate as to provide maintenance access.
- L. Install trap primers for floor drains per state codes. Refer to detail on drawings for installation requirements.
- M. 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

**SECTION 22 15 00
COMPRESSED-AIR SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air compressor.
- B. System filters.
- C. Air receivers.
- D. Pipe and fittings.
- E. Unions and couplings.
- F. Pressure reducing stations.
- G. Air outlets.

1.02 RELATED REQUIREMENTS

- A. Section 22 05 23 - General-Duty Valves for Plumbing Piping.
- B. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- C. Section 22 05 53 - Plumbing Identification.

1.03 REFERENCE STANDARDS

- A. ASME BPVC - Boiler and Pressure Vessel Code; 2015.
- B. ASME B31.3 - Process Piping; 2020.
- C. ASME B31.3 - Process Piping; 2020.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. Operation Data: Submit for pressure reducing station.
- B. Maintenance Data: Submit for pressure reducing station.
- C. 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.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept air compressor from owner, and additional equipment on site in factory fabricated containers with shipping skids and plastic pipe end protectors in place. Inspect for damage.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- F. Protect piping and equipment from weather and construction traffic.

1.07 WARRANTY

PART 2 PRODUCTS

2.01 PIPE AND PIPE FITTINGS

- A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded to ASME B31.1.
 - 3. Joints and fittings: For pipe sizes 2" 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 EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer.
 - a. Viega: MegaPress
 - b. Apollo: PowerPress
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
 - 4. An approved new press tool shall be provided to the owner if using press fittings. Press tool shall be cordless with two lithium ion batteries, charging station and press jaws sizes 1/2", 3/4", 1", 1-1/4", 1-1/2" and 2" in size.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, solder, Grade Sn95.
- C. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), annealed.
 - 1. Mechanical Press Sealed Fittings: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.
 - a. Fittings 3/4" - 2": ASME B31.3 - ASME B31.9, ASME B1.20.1, compression style, nylon body with fiberglass reinforcement, blue color, 304 stainless steel bite ring, nitrile o-ring.
 - b. Manufacturers:
 - 1) Apollo Valves: www.apollovalves.com/#sle.
 - 2) Viega LLC: www.viega.com/#sle.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Joints: Mechanically pressed.
- D. Aluminum Tube: ASME B31.3, 6063 alloy, T5 temper.
 - 1. Manufacturers:
 - a. UniPipe Solutions:
 - b. Rapid Air Compressed Air Systems:
 - c. AirCom Piping Systems:
 - d. Prevost Corporation: www.prevostusa.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Maximum Working Pressure: 230 psi.
 - 3. Fittings and Joints 2-1/2 inch and Smaller:
 - a. Fittings: Comply with ASME B31.1 and ASME B31.3, aluminum or iron.
 - b. Joints: Mechanical compression, coupling, push-connect bite ring coupling with stainless steel clamping washer, or threading.
 - c. Gasket Material: High nitrile rubber seal suitable for operating temperature range from minus 4 to 176 degrees F.

2.02 VALVES

- A. Ball Valves:
 - 1. Manufacturers:
 - a. Conbraco Industries / Apollo Valves.

- b. Nibco, Inc.
 - c. Crane Co. - Valve Division.
 - d. Hammond.
 - e. Watts.
 - f. Milwaukee Valve Company.
 - g. Kitz
 - h. Substitutions: See Section 01600 - Product Requirements.
2. 1, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded, or press ends with union.
- B. Swing Check Valves:
- 1. Manufacturers:
 - a. Conbraco Industries / Apollo Valves.
 - b. Nibco, Inc.
 - c. Crane Co. - Valve Division.
 - d. Hammond.
 - e. Watts.
 - f. Milwaukee Valve Company.
 - g. Kitz.
 - h. Substitutions: See Section 01600 - Product Requirements.
 - 2. 1, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder, threaded, or press ends.
- C. Air Outlets:
- 1. Quick Connector: 3/8 inch brass, snap on connector with self closing valve, Style M.
 - 2. Quick Connector: 1/2 inch brass, snap on connector with self closing valve, Style M where noted on drawings.

2.03 UNIONS AND COUPLINGS

- A. Unions:
 - 1. Ferrous Pipe: 150 psi malleable iron threaded unions with threaded or press joints.
 - 2. Copper Tube and Pipe: 150 psi bronze unions with soldered joints.
- B. Dielectric Connections: Union with galvanized or plated steel threaded or press end, copper solder end, water impervious isolation barrier.
- C. Flexible Connector: Neoprene with brass threaded connectors.

2.04 AIR COMPRESSOR

- A. Manufacturers:
 - 1. Ingersoll-Rand.
 - 2. FS-Curtis, a brand of Curtis-Toledo, Inc; NxHE Series High Efficiency: us.fscurtis.com/#sle.
 - 3. Quincy.
 - 4. Campbell Hausfeld.
 - 5. Speedaire.
 - 6. Atlas - Copco.
 - 7. California Air Tools
 - 8. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Type: Simplex compressor unit consisting of air cooled compressor, air receiver, neoprene isolators, operating controls.
- C. Screw Compressors:

1. Unit: Direct drive variable speed, rotary screw compressor with contact cooling, noise entuation enclosure, control panel with touchscreen, built in diagnostics.
 2. Motor: Hybrid Permanent Magnet (HPM) motor. Variable speed drive on main motor and centrifugal fan motor. 95% minimum efficiency, 1.25 service factor, direct attachment of HPM motor to primary rotor shaft. Motor shall be capable of unlimited start/stops and be capable of starting under a load.
 3. Vibration Isolation: Motor and compressor shall be mounted on sub-base anti-vibration pads.
 4. Lubrication System: Ultra Coolant, 100% synthetic lubricant with 8,000 hour service life. System shall contain a 4 port thermostatic control valve to control quantity of coolant from one of 4 sources (from the pressurized receiver/separator, from the valve to the cooler, from the cooler, to the coolant filter). Coolant shall be injected through a single port on the female rotor side to ensure pre-sealing of rotor. Coolant receiver / seperator shall seperate coolant from air before entrance to a two-stage colaescing seperator capable of removal of coolant down to 3 ppm.
 5. Cooling System: Air cooled sequential cooling system with an "coolant conditioner" system comprising of a combination of an inverter controlled cooling blower motor, and coolant system to maintain proper lubricant temperature. After cooler and oil cooler are to be constructed of aluminum fin design.
 6. Fan Motor: TEFC high efficiency, low noise fan located behind the coolers.
 7. Compressor/Capacity Control: Unit shall be controlled by an intelligent microprocessor capable of providing a turndown range to 35-61% at a system efficiency of 92% or greater. Whenever system drops below minimum turndown, the control methodology shall turn the compressor unit off to take advantage of the HPM motors ability of unlimited start/stops. Control shall be capable of automatic restart under a load.
 8. Control panel: Factory mounted NEMA ICS 4 panel with starter and refrigeration controls including:
 - a. Non-fused molded case disconnect switch.
 - b. Single point power connection and grounding lug.
 - c. Anti-recycle timer.
 - d. Solid state overload relay for each compressor.
 - e. Phase loss/reversal monitor.
 - f. Cycle counter and hour meter per compressor.
 - g. Automatic shutdown on compressor overload.
 - h. Real-time electronic maintenance indicators and shutdown protection.
- D. Capacity:
1. Refer to drawings for continious airflow delivery capacity.
 2. Verify set discharge pressure with owner.
- E. Electrical Characteristics:
1. Refer to drawings for size.
- F. Motor: NEMA MG 1 ____ .
- G. Controls:
1. Pressure Switch: Line voltage contactor to break at 100 psi with minimum differential of 20 psi.
- H. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
- I. Disconnect Switch: Factory mount disconnect switch in control panel.

2.05 AIR DRYERS

- A. Type: Self-contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, automatic controls, moisture removal trap, internal wiring and piping, and full refrigerant charge.
- B. Air Connections: Inlet and outlet connections at same level, factory insulated.
- C. Heat Exchangers: Air to air and refrigerant to air coils. Provide heat exchangers with automatic control system to bypass refrigeration system on low or no-load condition.
- D. Moisture Separator: Centrifugal type located at discharge of heat exchanger.
- E. Refrigeration Unit: Hermetically sealed type to operate continuously to maintain specified 21 degrees F dew point. House unit in steel cabinet provided with access door and panel for maintenance and inspection.
- F. Accessories: Air inlet temperature gauge, air inlet pressure gauge, on/off switch, high temperature light, power on light, refrigerant gauge, air outlet temperature gauge, air outlet pressure gauge.
- G. Capacity:
 - 1. Rated Air Flow: 55 cfm.
 - 2. Inlet Air Pressure: 145 psi.
 - 3. Pressure Differential from Inlet to Outlet: Maximum 1.5 psi.
- H. Electrical Characteristics:
 - 1. 120 volts, single phase, 60 Hz.
 - 2. 20 amperes maximum fuse size.
 - 3. See Section 26 05 83.
- I. Motor: See Section 22 05 13.
- J. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
- K. Disconnect Switch: Factory mount disconnect switch in control panel.
- L. Cord and Plug: Provide unit with 6 foot cord and plug for connection to electric wiring system including grounding connector.

2.06 UNIONS AND COUPLINGS

- A. Unions:
 - 1. Ferrous Pipe: 150 psi malleable iron threaded unions.
 - 2. Copper Tube and Pipe: 150 psi bronze unions with soldered joints.
- B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- C. Flexible Connector: Neoprene with brass threaded connectors.

2.07 PRESSURE REDUCING STATIONS

- A. Regulator/Lube/Filter: Consisting of adjustable regulator valve with gauge, provide lube and replaceable filter assembly. Metal bowl construction, 3/8 NPT, manual drain.
- B. Valve Capacity: Reduce pressure from 250psi to 30 psi, adjustable upwards from reduced pressure.

2.08 CENTRIFUGAL SEPARATOR / FILTER

- A. High efficiency in-line separator core and glass fiber filter. 60 scfm capacity with 99% liquid removal capacity and solid particle removal down to 3 microns. Separator shall be equal to Kaeser model KFS-60.

2.09 GENERAL PURPOSE COALESCING FILTER

- A. Coshocton: General Purpose Coalescing filter, particulate removal down to 1.0 micron and coalescing filtration down to 0.5 ppm per weight.
- B. Tuscarawas: General Purpose Coalescing filter, particulate removal down to 3.0 micron and coalescing filtration down to 5.0 ppm per weight.

2.10 FILTER / REGULATOR STATION

- A. Manufacturers
 - 1. ARO
 - 2. Ingersoll Rand
 - 3. Balcrank
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Construction: 3/4" NPT, metal bowl with sight glass, polycarbonate regulator body, standard dial, 0-140 psig pressure gauge, manual drain
- C. Filter: 5 micron

2.11 HOSE REEL

- A. Heavy duty all steel construction with power spring hose return, 8 position locking ratchet, adjustable outlet arm with four non-snap roller outlet, hose and hose stop.
- B. Hose: 50 foot of 1/2 inch I.D. hose rated for 300 psi minimum.

2.12 AIR OUTLETS / QUICK COUPLERS

- A. Manufacturers:
 - 1. Parker; Model 25-F
 - 2. Aero
 - 3. Balcrank
 - 4. Dyna-Quip
 - 5. Foster
 - 6. Hansen
 - 7. Hoffman
 - 8. Milton
 - 9. Schrader
 - 10. Graco
 - 11. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Quick Connector: 1/2" inch brass, snap-on connector with self closing valve, Style M. Verify body size and type with the Owner before ordering. Provide (1) companion male quick coupler per female quick coupler to the Owner.
- C. Steel, 1/2 in. female pipe thread, 1/2 in. body. Verify body size and type with the Owner before ordering. Provide (1) companion male quick coupler per female quick coupler to the Owner.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions.
- B. Install compressor unit on neoprene vibration isolators. Level and bolt in place.
- C. Make air cock and drain connection on horizontal casing.
- D. Install line size ball valve and check valve on compressor discharge.
- E. Install replaceable cartridge type filter silencer of adequate capacity for each compressor.
- F. Connect condensate drains to nearest floor drain.

- G. Install valved drip connections at low points of piping system. See Section 22 05 23.
- H. Install takeoffs to outlets from top of main, with shut off valve after takeoff. Slope takeoff piping to outlets.
- I. Install compressed air couplings, female quick connectors, and pressure gauges where outlets are indicated.
- J. Install tees instead of elbows at changes in direction of piping. Fit open end of each tee with plug.
- K. All piping routed to the exterior of the building shall be painted with weather resistant painting to prevent rusting of piping and fittings.
- L. Identify piping system and components. See Section 22 05 53.

3.02 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. Compressed Air Piping
 - 1) Pressure Test at 50 lbs. above maximum pressure for 4 hours.
 - 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.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 43 00 - Quality Assurance, for additional requirements.
- B. Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ASME B31.1.
- C. Repair or replace compressed air piping as required to eliminate leaks, and retest to demonstrate compliance.

D. Cap and seal ends of piping when not connected to mechanical equipment.

3.04 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 feet.
 - 2) Hanger rod diameter: 3/8 inch.
- b. Pipe size: 1-1/2 inches to 2 inches:
 - 1) Maximum hanger spacing: 10 feet
 - 2) Hanger rod diameter: 3/8 inch

END OF SECTION

**SECTION 22 30 00
PLUMBING EQUIPMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. High Efficiency Tank Type Water Heater - Gas Fired

1.02 RELATED REQUIREMENTS

- A. Section 22 0519 - Meters and Gages
- B. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- C. Section 22 0553 - Plumbing Identification
- D. 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; 2011.
- B. ANSI Z21.10.3 - Gas-Fired Water Heaters - Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous; 2014.

1.04 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.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
- B. Product Data:
 - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Indicate pump type, capacity, power requirements.
 - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
 - 4. Provide electrical characteristics and connection requirements.
- C. 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.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

- B. 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.

1.07 CERTIFICATIONS

- A. Gas Water Heaters: Certified by CSA International to ANSI Z21.10.1 or ANSI Z21.10.3, as applicable, in addition to requirements specified elsewhere.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.09 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 HIGH EFFICIENCY TANK TYPE WATER HEATER - GAS FIRED

- A. Manufacturers:
 - 1. Lochinvar "Shield"
 - 2. Laars "UHE"
 - 3. A.O. Smith Corporation "Cyclone"
 - 4. Bradford White "EF"
 - 5. Bock Water Heaters, Inc.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Fabrication
 - 1. Water heater shall consist of a direct fired stainless steel heat exchanger mounted on top of a glass lined storage tank. Assembly shall be contained in a heavy gauge steel jacket assembly, primed and painted on both sides. All piping between heater and tank shall be contained in jacket.
 - 2. Heat exchanger shall be constructed in accordance with ASME Section IV Code and water heater shall bear the ASME "HLW" stamp.
 - 3. There shall be no banding material, bolts, gaskets, or "O" rings in the header configuration.
 - 4. Stainless steel combustion chamber shall be designed to drain condensation to the bottom of the heat exchanger assembly. A built-in trap shall allow condensation to drain from the heat exchanger assembly.
- C. Fuel Burning System
 - 1. The water heater shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard. The water heater shall operate at a minimum of 95% thermal efficiency.

2. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame observation port shall be provided. The burner shall be a premix design and constructed of high temperature stainless steel with a woven metal fiber outer covering to provide modulating firing rates. The water heater shall be supplied with a gas valve designed with negative pressure regulation and be equipped with a variable speed blower system, to precisely control the fuel/air mixture to provide modulating water heater firing rates for maximum efficiency. The water heater shall operate in a safe condition at a derated output with gas supply pressures as low as 4 inches of water column.
 3. The water heater shall be capable of full modulation firing down to 20% of rated input with a turn down ratio of 5:1.
 4. Gas Type: Natural Gas.
- D. Trim
1. Water heater shall be equipped with a high limit temperature control certified to UL353, ASME certified pressure relief valve, outlet water temperature sensor, inlet water temperature sensor, a UL 353 certified flue temperature sensor, low water flow protection, and built in freeze protection.
 2. Water heater shall be provided with condensate neutralization kit.
- E. Control
1. The water heater shall be equipped with two terminal strips for electrical connection. A low voltage connection board with data points for safety and operating controls, i.e., auxiliary relay, auxiliary proving switch, alarm contacts, runtime contacts, manual reset low water cutoff, flow switch, high and low gas pressure switches, tank thermostat, tank sensor, building management system signal, modbus control contacts, and cascade control circuit. A high voltage terminal strip shall be provided for supply voltage. The high voltage terminal strip plus integral relays are provided for independent control of domestic hot water pumps and building re-circulation pumps.
 2. Set hot water storage tank temperature to 140 degrees F (adj.)
- F. Venting
1. Water heater shall be vented per manufacturer's requirements, in accordance with applicable national and local codes.
- G. Pump
1. Type: All bronze, in-line circulation pump mounted in return line to water heater, controlled by associated water heater. Pump and associated piping shall be pre-piped and installed within sheetmetal jacket.
- H. Storage Tank
1. Welded Steel, Non ASME, working pressure of 125 psig.
 2. Continuous porcelain enamel lining (glass lining).
 3. Insulation: 2" High Density insulation jacket meeting the requirements of the latest edition of ASHRAE 90.1, encased in corrosion resistant steel jacket, baked-on enamel finish.

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 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.

END OF SECTION

**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. Service sinks.
- E. Electric water coolers.
- F. Emergency Eye wash fountains.

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 11 40 00 - Foodservice Equipment: Food service sinks.
- D. Section 11 53 00 - DO NOT USE - Laboratory Equipment: Laboratory sinks.
- E. Section 22 10 05 - Plumbing Piping.
- F. Section 22 10 06 - Plumbing Piping Specialties.
- G. Section 22 30 00 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

- A. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2014.
- B. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration.; 2013.
- C. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- D. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
- E. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018.
- F. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2017.
- G. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- I. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- J. 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: 1.6 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 type with oscillating handle, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker
 - 3. Water consumption: 1.6 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. Watts Drainage
 - b. JOSAM Company.
 - c. Sloan Valve Company.
 - d. Zurn Industries, Inc.
 - e. Wade.
 - f. 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. 500 pound load capacity
 - 4. 3" sanitary outlet

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 type, complete with oscillating handle, escutcheon, integral screwdriver stop and vacuum breaker.
 - 3. Water Consumption: 0.5 gallon per flush
- D. Carriers:
- 1. Manufacturers:
 - a. Watts Drainage.
 - b. JOSAM Company.
 - c. Sloan Valve Company.

- d. Zurn Industries, Inc.
- e. 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. 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. 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: 0.5 gpm
- D. 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.
- E. Carrier:
 - 1. Manufacturers:
 - a. Zurn Industries, Inc.

- b. JOSAM Company: www.josam.com.
 - c. Sloan Valve Company: www.sloanvalve.com.
 - d. Wade.
 - e. Watts Drainage.
 - 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, concealed arm supports, bearing plate and studs.

2.05 ELECTRIC BOTTLE FILLER

- A. Manufacturers:
- 1. Halsey Taylor
 - 2. Tri Palm International/Oasis
 - 3. Elkay Manufacturing Company: www.elkay.com/#sle.
 - 4. Haws Corporation: www.hawesco.com/#sle.
 - 5. Murdock Manufacturing, Inc: www.murdockmfg.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Bottle Filler:
- 1. Surface handicapped mounted electric water cooler with stainless steel top, stainless steel body, automatic stream regulator, 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.

2.06 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. Wall Service Sink:
- 1. 26 x 22 x 14 inch high white molded fiberglass, floor mounted with mounting legs and brackets and filler panels, 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 polished chrome plated cast brass, 1/4 turn ceramic disc valving with ADA lever handles, 8 inch swing spout, 2.0 GPM variable orifice aerator, 4 inch centers.

2.07 EMERGENCY EYE AND FACE WASH

- A. Emergency Wash Manufacturers:
 1. Haws Corporation
 2. Bradley Corporation
 3. Guardian Equipment
 4. Acorn Safety.
 5. Speakman
 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Emergency Wash: ANSI Z358.1; wall-mounted, self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor, twin eye wash heads and face spray ring, stainless steel dust cover, copper alloy control valve and fittings.

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

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Division 23

Heating, Ventilating and
Air-Conditioning (HVAC)

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**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. 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, 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.
- 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 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 REFERENCE STANDARDS

- A. Standards are described by reference to various associations. These are in addition, but not limited 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.

1.05 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 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.

1.07 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 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.

1.08 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.

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 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.

3.07 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

**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. 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

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**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.

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.

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 six weeks prior to starting the testing, adjusting, and balancing work.
 - 3. 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 Construction Manager 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. 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:
 - g. Project Contractor.
 - h. Project altitude.
 - i. Report date.
- 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. 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.
- I. 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 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 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Air Coils.
 - 2. Terminal Heat Transfer Units.
 - 3. Fans.
 - 4. Air Filters.
 - 5. Air Terminal Units.
 - 6. Air Inlets and Outlets.

2.08 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. 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.
- F. 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.
- G. 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.
- H. 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.
- I. 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.
- J. 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.
- K. Sound Level Reports:
 1. Location.
 2. Octave bands - equipment off.
 3. Octave bands - equipment on.

END OF SECTION

**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. Section 07 84 00 - Firestopping.
- B. Section 23 05 53 - HVAC Identification.
- C. 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 E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- F. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.
- H. ASTM E 119 (UL 263) - Standard Test Methods for Fire Tests of Building Construction and Materials.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- J. 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.

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. 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.
- D. Supply Ducts:
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 noted on the drawings.
 4. Rigid Glass Fiber Duct Liner Insulation: 1 inches thick, where noted on the drawings.

END OF SECTION

**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. Testing and Repair

1.02 RELATED REQUIREMENTS

- A. Section 01 3516.01 - Material Documentation Sheet
- B. Section 01 5721 - IAQ Construction and Preoccupancy
- C. Section 01 5721.01 - IAQ Planning Checklist
- D. Section 01 5721.02 - IAQ Inspection Checklist
- E. Section 01 5721.03 - IAQ Log.
- F. Section 01 6116.01 - Accessory Material VOC Content Certification Form.
- G. Section 09 91 13 - Exterior Painting: Weld priming, weather resistant, paint or coating.
- H. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
- I. Section 23 07 13 - DUCT INSULATION: External insulation and duct liner.
- J. Section 23 33 00 - Air Duct Accessories.
- K. Section 23 37 00 - Air Outlets and Inlets.

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; 2020.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.
- E. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.
- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2021.
- G. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.
- H. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012, 2nd Edition.
- I. ASHRAE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- J. 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. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for systems.
- D. Sheet metal shop coordination drawings shall be provided by the Division 23 mechanical contractor. Refer to Section 23 0501 for coordination drawing requirements.
- E. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK).
- F. 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.
- 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 A924 standards for hot dip galvanized sheet and ASTM A653 quality.
- D. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 2 years of documented 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.
- C. Refer to section 01 5721 - IAQ Construction and Preoccupancy for additional requirements.

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. Round and Oval 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.
- C. 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.
- D. 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.
- E. 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.
- F. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

- G. 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 perforated 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 than 12" and a height greater than 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 Diameter/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 Safe 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 equivalent 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.

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. All supply make-up air ductwork connected to roof mounted supply air make-up fan and kitchen range hood shall be sealed at all joints with silicone sealer. Duct shall be wrapped with insulation.
- U. Clean interior of ductwork, leaving it free of loose material and construction debris.
- V. 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.
- W. 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.
- X. 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.
- Y. 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.
- Z. Install suspension system in accordance with manufacturer's requirements. Installation instructions shall be provided with fabric duct system by unit manufacturer.
- AA. All sheetmetal ductwork in student dining / stage, shop areas, corridors, 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. 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.

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.

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. Outside Air Intake: Galvanized Steel.

END OF SECTION

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**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.
- G. Motorized Backdraft / Relief Damper

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; 2021.
- 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/extracotr 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 than 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 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 accommodate exterior ductwork insulation, to allow manual damper handle to be clear of supply ductwork.

2.05 MOTORIZED BACKDRAFT/RELIEF 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 6000 - Product Requirements

B. Fabricate in accordance with SMACNA HVAC duct construction standards - Metal and flexible, as indicated.

C. Dampers, unless otherwise specified, shall be low leakage dampers and shall be designed for tight shut-off such that for a 1500 fpm damper leakage does not exceed 1 percent at 6 inches w.g. Silent closing replacable butyl and neoprene seals shall be provided on blades on all four sides of the frame. Louver linkage to be concealed in frame channel outside of the air stream. Bearings shall be nylon bushings or impregnated sintered iron. Rigid blades shall be constructed of not lighter than double 22 gauge and shall have 6 inches maximum blade width.

Frames shall have welded corners and shall be diagonally braced.

- D. Whenever possible, damper size shall match ductwork size. The contractor shall verify air velocity and notify the engineer of sizing concerns prior to installation of dampers.

2.06 DAMPER ACTUATORS

- A. Damper actuators shall be provided by temperature control contractor and installed by Division 23 HVAC contractor. Refer to specification section 23 0913.

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. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- E. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- F. 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.
- G. Provide balancing dampers on high velocity systems where indicated. Refer to Section 23 36 00 - Air Terminal Units.
- 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

**SECTION 23 34 23
HVAC EXHAUST FANS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof exhausters.
- B. Cabinet exhaust fans.
- C. Upblast roof exhausters.
- D. Inline / Ceiling exhaust fans.

1.02 RELATED REQUIREMENTS

- A. Refer to Section 01 6000 - Product Requirements
- B. Section 23 0548 - Vibration and Seismic Controls.
- C. 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 1 - Motors and Generators; 2018.
- 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 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. Backdraft Damper: motorized, non-overloading motor, aluminum frame, aluminum multiple blade construction, gasketed edge, aluminum hinge pins, brass bushings, blades linked. Provide all roof exhausters with fan manufacturer's motorized backdraft damper.
- G. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.
- H. 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.
- I. 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.

2.03 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. Grille: Molded white plastic.

- D. Backdraft Damper: motorized, non-overloading motor, aluminum frame, aluminum multiple blade construction, gasketed edge, aluminum hinge pins, brass bushings, blades linked.
Provide all Inline exhausters with fan manufacturer's motorized backdraft damper.
- E. 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.
- 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. Automatic belt tensioner shall be provided with all belt drive fans.
- G. 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.

2.04 UPBLAST ROOF EXHAUSTERS

- A. Shafts and Bearings:
 - 1. Fan Shaft:
 - a. Ground and polished steel with anti-corrosive coating.
 - b. First critical speed at least 25 percent over maximum cataloged operating speed.
 - 2. Bearings:
 - a. Permanently sealed or pillow block type.
 - b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
 - c. 100 percent factory tested.
- B. Drive Assembly:
 - 1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
 - 2. Belts: Static free and oil resistant.
 - 3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
 - 4. Motor pulley adjustable for final system balancing.
 - 5. Readily accessible for maintenance.
- C. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

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

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**SECTION 23 35 16
ENGINE EXHAUST SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Centrifugal fans.
- B. Ductwork and duct accessories.
- C. Inlet fittings.
- D. Exhaust system hose reel and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 6000 - Product Requirements
- B. Section 23 05 48 - Vibration and Seismic Controls: Vibration isolators.

1.03 REFERENCE STANDARDS

- A. ACGIH (IV) - Industrial Ventilation, A Manual of Recommended Practice; 2010, 28th edition.
- B. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- C. AMCA 99 - Standards Handbook; 2016.
- 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. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.
- H. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2020.
- I. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, Culvert Pipe (Metric); 2020.
- J. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2020.
- K. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2020.
- L. ASTM D2996 - Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe; 2017.
- M. ASTM D2997 - Standard Specification for Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe; 2021.
- N. AWS D9.1M/D9.1 - Sheet Metal Welding Code; 2012.
- O. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2021.
- P. SMACNA (RIDC) - Rectangular Industrial Duct Construction Standards; 2007.
- Q. SMACNA (ROUND) - Round Industrial Duct Construction Standards; 1999.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers literature and data sheets indicating rated capacities, dimensions, weights and point loadings, accessories, electrical characteristics and connection

requirements, wiring diagrams, and location and sizes of field connections.

1. Provide fan curves with specified operating point clearly plotted.
 2. Submit sound power levels for both fan inlet and outlet at rated capacity.
- C. Shop Drawings: Indicate dimensions, sizes, weights and point loadings, and locations and sizes of field connections.
- D. Manufacturer's Installation Instructions: Include assembly and installation instructions.
- E. Operation and Maintenance Data: Include instructions for fan lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.05 QUALITY ASSURANCE

- A. Fan Performance Ratings: Determined in accordance with AMCA 210 and labeled with AMCA Certified Rating Seal.
- B. Fan Sound Ratings: AMCA 301, tested to AMCA 300 and label with AMCA Certified Sound Rating Seal.
- C. Fan Fabrication: Comply with AMCA 99.
- D. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- E. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 CENTRIFUGAL FANS

- A. Manufacturers:
1. Aerovent
 2. Loren Cook Company
 3. PennBarry
 4. Greenheck
 5. Lincoln Electric
 6. Loren Cook Company
 7. _____.
 8. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Base performance on sea level conditions.
- C. Wheel and Inlet:
1. Backward Inclined: Steel construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and back plate; cast iron hub riveted to back plate and keyed to shaft with set screws.
 2. Radial: Steel construction with inlet flange, back plate, plate blades with reinforcing gussets welded or riveted to back plate and flange; cast iron hub riveted to back plate and keyed to shaft with set screws.
- D. Housing: Heavy gage steel, spot welded with inlet bell and shaped cut-off, factory finished with enamel or prime coat. Provide bolted construction with horizontal flanged split housing.
- E. Motors and Drives:
1. Bearings: Heavy duty pillow block type, self-aligning, grease-lubricated ball bearings or roller bearings.
 2. Shafts: Hot rolled steel, ground and polished, with key-way, protectively coated with lubricating oil.
 3. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, keyed, variable and adjustable pitch, matched belts, and rated minimum 1.5 times nameplate rating of motor.

4. Belt Guard: Fabricate to SMACNA (DCS); of 12 gage, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated.
- F. Accessories:
1. Bolted Access door, drain with plug.
 2. Flanges: Inlet and outlet flanges with prepunched holes.
 3. Guard: OSHA type belt guard, shaft and bearing guard. All guards to be painted safety "yellow".
 4. Fan base: Single unitary base for fan and motor. Isolators not required for fan base.
 5. Miscellaneous: Bolted Access door, Drain with plug, discharge silencer.

2.02 DUCTWORK AND DUCT ACCESSORIES

- A. Materials:
1. Galvanized Steel Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B. Ductwork:
1. Fabricate and support in accordance with:
 - a. SMACNA (DCS).
 - b. SMACNA (RIDC) and SMACNA (ROUND).
 - c. ACGIH (IV) - Industrial Ventilation Manual.
 2. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline.
 3. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
 4. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA (ROUND).
 5. Joints: Minimum 4 inch cemented slip type, brazed or electric welded to comply with AWS D9.1M/D9.1. Prime coat welded joints.
 6. Provide standard 45 degree lateral wye branch fittings unless otherwise indicated.
 7. Use double nuts and lock washers on threaded rod supports.
- C. Flexible Connectors: UL listed, fire-retardant polyethylene impregnated fabric, minimum density 20 oz per sq yd, approximately 2 inches wide, crimped into metal edging strip.

2.03 EXHAUST SYSTEM HOSE REEL AND ACCESSORIES

- A. Manufacturers:
1. Monoxivent.
 2. Plymovent
 3. Car-Mon Products
 4. Nederman
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Automatic Spring Hose Reel: Designed for manual extension and spring return of exhaust hose. Assembly consists of of steel hose reel drum, steel end flanges, high carbon steel drive spring(s), brake mechanism, hose stop, hose guide and 25 feet of 4 inch diameter hose as shown on drawings.
- C. Tail Pipe Adapters: Rubber formed to tapered cone with spring clip attachment, adapter size 6 inch, for connection to 2-1/2 inch diameter hose.
- D. Flexible Exhaust Hose: Heat resistant neoprene coated fabric spring steel wire reinforced, rated for duty to 1300 and 20 inches WG positive or negative.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions.
- B. Install flexible connections at fan inlet and discharge. Ensure metal bands of connectors are parallel with minimum 1 inch flex between ductwork and fan while running.
- C. Provide pitot tube openings where required for testing of systems, complete with metal cap with spring device or screw to ensure against air leakage.
- D. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- E. Secure all duct and elbow joints with self-tapping screws and caulk or hardcast type sealer.

END OF SECTION

**SECTION 23 37 00
AIR OUTLETS AND INLETS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.

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 Insepection 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; 2021.

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. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 CEILING SUPPLY: TYPE CD

- 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.

2.03 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.

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

**SECTION 23 37 10
EXTERIOR WALL LOUVERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Rectangular drainable 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 Association.

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-601'. 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 RECTANGULAR DRAINABLE WALL LOUVERS-TYPE -VERTICAL

- A. Stormproof, aluminum construction
- B. Aluminum bird screen of .051 material tightly stretched and suitably braced to prevent sagging.
- C. Frame shall be 6 inches deep and constructed of 6063T5 extruded aluminum of .081 inch minimum wall thickness.
- D. Blades shall be vertical, rain resistant style, constructed of 6063T5 extruded aluminum of .081 inch nominal wall thickness. Blades shall be the drainable type, with 2 inch spacing center to center.
- E. 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.
- F. Include sills, mullion, sill extensions, and anchorages as required.
- G. Finish shall be factory applied baked enamel to color as selected by Architect. Contractor shall assume two (2) standard colors.
- H. Rectangular louvers shall be equal to the design base Greenheck, Model 'EVH-602'.

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

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**SECTION 23 54 00
FURNACES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Gas Fired Forced Air Furnace.
- B. Evaporator Coil
- C. Air Cooled Split DX Air Conditioning Unit.
- D. Thermostat

1.02 RELATED REQUIREMENTS

- A. Section 22 05 13 - Common Motor Requirements for Plumbing Equipment: Additional requirements for fan motors.
- B. Section 23 07 13 - DUCT INSULATION: Duct liner.
- C. Section 23 3100 - HVAC Ducts and Casings
- D. Section 23 3300 - Air Duct Accessories
- E. 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. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment; Air Conditioning and Refrigeration Institute.
- B. ANSI Z21.47 - American National Standard for Gas-Fired Central Furnaces; 2012.
- C. 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.
- D. NFPA 54 - National Fuel Gas Code; 2021.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- F. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; 2019.

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.
 - 1. Design Data: Indicate refrigerant pipe sizing.
- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation 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 manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard warranty for all components.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. The Carrier Corporation.
- B. The Trane Company.
- C. York International Corporation.
- D. Rheem
- E. Bryant.
- F. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GAS FIRE FORCED AIR FURNACES

- A. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, humidifier, and accessories; wired for single power connection with control transformer.
 - 1. Safety certified by CSA in accordance with ANSI Z21.47.
 - 2. Venting System: Direct.
 - 3. Combustion: Sealed.
 - 4. Air Flow Configuration: Upflow.
 - 5. Heating: Natural gas fired.
 - 6. Accessories:
 - a. Concentric roof termination kit.
- B. Performance:
 - 1. Ratings: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1; seasonal efficiency to ASHRAE Std 103.
 - 2. Refer to Furnace Schedule. Gas heating capacities are sea level ratings.
- C. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner. If not certified for combustible flooring, please provide additional steel base.
- D. Primary Heat Exchanger:
 - 1. Material: Aluminized steel.
- E. Secondary Heat Exchanger:
 - 1. Material: Stainless steel.
- F. Gas Burner:
 - 1. Atmospheric type with adjustable combustion air supply.
 - 2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
 - 3. Electronic pilot ignition, with electric spark igniter.
 - 4. Non-corrosive combustion air blower with permanently lubricated motor.
- G. Gas Burner Safety Controls:
 - 1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
 - 2. Flame rollout switch: Installed on burner box and prevents operation.
 - 3. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.

- 4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.
- H. Supply Fan: Centrifugal type rubber mounted with direct drive motor.
- I. Motor:
 - 1. 1750 rpm single-speed, permanently lubricated, hinge mounted.
- J. Air Filters: 1 inch thick glass fiber, disposable type arranged for easy replacement.
 - 1. Filters shall have a minimum rating of MERV 8.
- K. Operating Controls:
 - 1. Room Thermostat: 7 day programmable thermostat as noted on drawings to cycle burner/cooling coil, air source heat pump unit to maintain room temperature setting.

2.03 EVAPORATOR COIL UNITS - A COIL

- A. Manufacturers
 - 1. The evaporator coil shall be the same manufacturer as the furnace.
- B. Construction and Ratings: In accordance with ARI 210/240 and UL 207.
- C. Evaporator coil: Copper tube aluminum fin assembly, galvanized drain pan, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve, steel cabinet with baked enamel finish and insulation.

2.04 AIR COOLED SPLIT DX AIR CONDITIONING UNIT

- A. Construction and Ratings: In accordance with ARI 210/240 and UL 207.
- B. Testing: ASHRAE std. 23.
- C. Construction: Outdoor-mounted, air cooled, split-system air conditioner unit suitable for ground installation. Unit shall consist of a hermetic compressor, air cooled coil, propeller type condenser fan, and a control box.
- D. Cabinet: Constructed of galvanized steel, bonderized, and coated with a powder coat finish.
- E. Fans: Condenser fan will be direct-drive propeller type, discharging air upward. Fan motors shall be totally enclosed, 1-phase typw with class B insulation and permanently lubricated bearings. Shafts shall be corrosion resistant. Fan blades shall be statically and dynamically balanced. Condenser fan openings shall be equipped with PVC-coated steel wire safety guards.
- F. Compressor: ARI 520; hermetic, 3600 rpm, 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. Compressor shall be mounted on rubber vibration isolators.
- G. Refrigeration Accessories: Refrigeration circuit components shall include liquid line shutoff valve with sweat connections, vapor line shutoff valve with sweat connections, and compressor oil. Unit shall be equipped with factory-supplied Thermal Expansion Valve (TXV), high pressure switch, low pressure switch and filter drier, and solid state defrost control utilizing thermistors.
- H. Refrigerant: Puron HFC or R410a.
- I. Refrigerant Line Set: Refrigerant line set, liquid & suction line, suction line insulated with 1" elastomeric insulation. Line set shall be constructed per ASTM B280.
- J. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
- K. Refrigeration Operating Controls: Room thermostat cycles condensing unit and supply fan to maintain room temperature setting.

2.05 THERMOSTATS

- A. Manufacturers:
 - 1. The Carrier Corporation.
 - 2. The Trane Company.
 - 3. York International Corporation.
 - 4. Lennox.
 - 5. Rheem.
 - 6. Bryant.
 - 7. Honeywell.
 - 8. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Room Thermostat: Low voltage, electric solid state microcomputer based room thermostat with remote sensor:
 - 1. Preferential rate control to minimize overshoot and deviation from setpoint.
 - 2. Set-up for four separate temperatures per day.
 - 3. Instant override of setpoint for continuous or timed period from one hour to 31 days.
 - 4. Short cycle protection.
 - 5. Programming based on weekdays, Saturday and Sunday.
 - 6. Battery replacement without program loss.
 - 7. Thermostat Display:
 - a. Time of day.
 - b. Actual room temperature.
 - c. Programmed temperature.
 - d. Programmed time.
 - e. Duration of timed override.
 - f. Day of week.
 - g. System Mode Indication: heating, cooling, fan auto, off, and on, auto or on, off.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and located correctly.
- C. Verify that proper fuel supply is available for connection.
- D. Verify that floors and equipment pads are ready for installation of equipment.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction.
- B. Install in accordance with NFPA 90A.
- C. Install gas fired furnaces in accordance with NFPA 54.
- D. Install gas fired furnaces in accordance with NFPA 58.
- E. Provide vent connections in accordance with NFPA 211.
- F. Mount counterflow furnaces installed on combustible floors on additive base.
- G. Install refrigeration systems in accordance with ASHRAE Std 15.
- H. Pipe drain from cooling coil and furnace unit to nearest floor drain.

END OF SECTION

**SECTION 23 55 33
FUEL FIRED HEATERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tubular infrared heaters.

1.02 RELATED REQUIREMENTS

- A. Section 23 51 00 - Breechings, Chimneys, and Stacks.

1.03 REFERENCE STANDARDS

- A. 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.
- B. NFPA 54 - National Fuel Gas Code; 2021.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- D. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; 2019.
- E. Gas Fired Infrared Heater Standard Z83.20/CSA 2.34, Latest Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and locations and sizes of field connections.
- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing.
- F. Warranty: Submit manufacturers warranty and ensure forms have been filled out 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.

1.06 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Gas Fired Infra-Red Heaters: Provide a three (3) year warranty from date of final acceptance of all other components including electrical.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

- A. Roberts Gordon
- B. Superior Radiant Products as provided by local manufacturer's representative.
- C. Detroit Radiant Products Company: www.detroitradiant.com.

- D. Ambirad, Inc.
- E. Combustion Research Corporation
- F. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 TUBULAR INFRARED HEATERS

- A. Infrared Heaters: Tubular type; packaged, partially factory assembled, pre-wired unit consisting of cabinet, burner, heat exchanger, radiant tube, reflector, controls; for natural gas.
- B. Heat Exchanger: Aluminized tubular steel combustion chamber with aluminized steel tube for the first ten feet, hot rolled steel for remainder. Connections shall be made with stainless steel coupling assemblies, muffler type connectors are unacceptable. Reflectors shall be deep dish-high efficiency and must be closed off on ends with A.G.A. approved end caps and overlapped to prevent convection heat loss.
- C. Gas Burner:
 - 1. Gas Burner: Forced draft type with adjustable combustion air supply.
 - 2. Gas valve provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
 - 3. Electronic pilot ignition, with electric spark igniter.
 - 4. Non-corrosive burner air blower with permanently lubricated motor.
- D. Gas Burner Safety Controls: Thermo-couple sensor prevents opening of solenoid gas valve until pilot flame is proven and stops gas flow on ignition failure.
- E. Operating Controls: Low voltage room thermostat cycles burner to maintain room temperature setting.
- F. Standard equipment shall include totally enclosed motor, thermal overload motor protection, balanced air rotor, combustion air proving safety pressure switch, stainless steel burner head, combustion chamber equipped with sight glass for visual inspection of ignitor element, burner flame, and stainless steel flexible gas connection (A.G.A. approved).
- G. Performance:
 - 1. Refer to Schedule. Gas heating capacities are sea level ratings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that space is ready for installation of units and openings are as indicated on shop drawings.
- B. Coordinate routing and elevation with all other utilities.
- C. Verify that proper power supply is available.
- D. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install gas fired infrared heaters as indicated, in accordance with manufacturer's installation operation and service manual and in compliance with applicable codes and approvals. Allow adequate space for servicing or removal of the unit without disturbing other piping or equipment.
- B. Install in accordance with NFPA 90A.
- C. Install gas fired units in accordance with NFPA 54 and applicable codes.
- D. Provide vent connections in accordance with NFPA 211. Refer to Section 23 51 00.
- E. Install per manufacturer's instructions.

- F. Suspend heat exchanger, burner, gas piping, conduit, and reflectors from building substrate as indicated, or if not indicated, in manner to provide durable and safe installation; and in accordance with manufacturer's installation instructions.
- G. Install vent piping as indicated. Terminate where indicated on the drawings with a vent terminal assembly as supplied by the manufacturer. The venting must be installed in accordance with the requirements within the installation operation and service manual and the following codes:
United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision.
Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.
- H. Do not exceed clearance to combustibles outlined and printed on burner nameplate, and in manufacturer's product data. Measure clearance distance from surface of heat exchanger or as indicated by approval agency's listing.

3.03 QUALITY CONTROL

- A. Start-up, test, and adjust gas fired infrared heaters in accordance with manufacturer's start-up instructions in the installation operation and service manual, and Utility Company's requirements. Check and calibrate controls, adjust burners if applicable according to manufacturer's installation operation and service manual instructions for maximum efficiency.

END OF SECTION

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Division 26

Electrical

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**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 Section 07 84 00 - Firestopping.
- E. Refer to Division 23 Mechanical Specifications and to the requirements stated therein applicable to the Electrical Work, where coordination of trades is covered.
- F. Refer to Division 27 Communications Specifications and to the requirements stated therein applicable to the Electrical Work, where coordination of trades is covered.
- G. 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.
- H. The requirements of this Section shall apply to Work for Sections listed under Division 26, Electrical.

1.02 RELATED REQUIREMENTS

1.03 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.

1.04 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

1.05 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. Product Data: Electrical Contractor shall provide submittals for firestopping. Refer to Specification Section 07 84 00 - Firestopping.

- D. 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. 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, generator, 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.
- E. The Contractor shall provide fire barrier seal around all conduit and box penetrations in fire rated wall. Refer to Specification section 07 84 00 - Firestopping for firestopping requirements.

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, Tipp City Exempted Village School District, Tipp City Schools New Bus Garage and Tennis Courts, 575 N. Hyatt 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

**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. 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.
- B. 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.
- C. 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.
- D. Electrical work installed in finished rooms of the existing building shall be installed in a concealed manner.
- E. Painting of patched work in the existing building will be the responsibility of this Contractor.
- F. 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

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**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.

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. Repair adjacent construction and finishes damaged during demolition and extension work.
- F. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- G. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or that are to be reused.

- B. 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.

END OF SECTION

**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

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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. Oxide inhibiting compound.
- F. Wire pulling lubricant.
- G. Cable ties.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 05 - MINOR ELECTRICAL DEMOLITION : Disconnection, removal, and/or extension of existing electrical conductors and cables.
- C. Section 31 23 16 - Excavation.
- D. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.
- E. 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 B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2011).
- F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation; 2007 (Reapproved 2012).
- G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.
- H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- I. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable; 2012.
- J. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
- K. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.
- L. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

- O. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- P. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- Q. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- S. 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. Design Data: Indicate sizing for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.
- D. 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.
- E. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing 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. 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. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
 - 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.
 - 4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.
- 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. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. 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.
 - 3. Connectors for Aluminum Conductors: Use mechanical connectors.
- C. Wiring Connectors for Terminations:
 - 1. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors where connectors are required.
 - 2. Aluminum Conductors: Use mechanical connectors for all connections.
 - 3. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for 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. 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. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- D. Cable Ties: Material and tensile strength rating suitable for application.
- E. Split Bolt Connectors.
- F. Solderless Pressure Connectors.

- G. Spring Wire Connectors.
- H. Compression Connectors.

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 aluminum conductors in accordance with NECA 104.
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. 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.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. 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.
- H. 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.
- I. Install conductors with a minimum of 12 inches of slack at each outlet.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

- L. 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. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
 - 6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
- M. 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.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. 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.
- P. 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.
- Q. Include an equipment ground conductor with each circuit.
- R. Provide dedicated neutrals for all circuits. Do not share neutrals.
- S. Wire and cable routing indicated is approximate unless dimensioned.
- T. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
- U. Install wire and cable in accordance with the NECA "Standard of Installation."
- V. Protect exposed cable from damage.
- W. 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.
- X. 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

**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.
- F. Grounding bus consisting of bare annealed 1/4 inch by 2 inch copper bars of rectangular cross section.

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 with grounding electrode and 1/0 AWG bare copper conductor.
- 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

**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; 2009.
- 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. 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.
 - 8. Substitutions: See Section 01 60 00 - Product Requirements.

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

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**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. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, flexible nonmetallic conduit, nonmetallic tubing, fittings, and conduit bodies.
- C. 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. 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.
- B. Fittings for Grounding and Bonding: Also comply with Section 26 05 26 - GROUNDING AND BONDING.
- C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Coordinate painting requirements with painting contractor where conduits are exposed due to open structure and the like.
- F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- G. Conduit Size: Comply with NFPA 70.
 - 1. Minimum size: 1/2" unless otherwise specified.
- H. 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.

- I. Outdoor Locations Above Grade: Use rigid steel conduit.
- J. Wet and Damp Locations: Use rigid steel or intermediate metal conduit.
- K. 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.
- L. 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.
- M. Where underground conduit enters a room and water entering through the conduit is a concern or an issue, provide a product similar to Raychem Rayplate Duct Sealing System at both ends of conduit to seal conduit air and water tight.
- N. 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.
- 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

**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. Wall and ceiling outlet boxes.
- D. 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.

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 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- 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 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 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. 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 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
 - 3. Material: Galvanized cast iron.
 - 4. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
 - 5. Cover Legend: "ELECTRIC".
 - 6. Cable Entrance: Pre-cut 6 x 6 inch cable entrance at center bottom of each side.
 - 7. Cover: Glass fiber weatherproof cover with nonskid finish.

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. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast 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

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**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 record voltages and ground loop impedance at various outlets.
 - b. Test and determine that system is free of short circuits and other faults.
 - c. That motor overload devices are properly sized.
 - d. Test and record meter reading to ground at various points and devices.
 - e. Record nameplate data for motors, together with final voltage, running current, size of run protection fuses, and thermal overloads.
 - f. 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

**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 2416 - Panelboards.
- F. 26 2726 - Wiring Devices.
- G. 26 2816.13 - Enclosed Circuit Breakers.
- 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.

- 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. 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.
 - 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.
 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:
 - 2. 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.

END OF SECTION

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**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. "Scotchlocks," 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

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**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.

END OF SECTION

**SECTION 26 07 02
GAS DETECTION SYSTEMS**

PART 1 GENERAL

2.01 DESCRIPTION

- A. Contractor is responsible for the Work described in this Section.

PART 2 PRODUCTS

3.01 GAS DETECTION SYSTEMS

- A. Supply and install as shown on drawings an ACME CEL Series Multipoint & Multigas Centralized Detection and Control System consisting of the following: NEMA 12 central monitoring panels with status lights, double-pole double-throw fan relays, CO sensors and NO₂ sensors. Panels and remote sensors/transmitters shall be by the same manufacturer.
- B. Refer to the drawings for location of the monitoring panels and sensors. Number of panels and sensors is as indicated on the drawings.
- C. The contractor is responsible for providing a complete and operable system including all hardware, material, wiring, etc. All interlocking wiring with mechanical equipment is the responsibility of the contractor.
- D. The location and number of sensors shown on the drawings are to be considered a minimum requirement. If the manufacturer recommends more sensors to be located/installed it is the responsibility of the contractor to provide and install the recommended number of sensors required by the manufacturer.
- E. All wiring to be in conduit.

3.02 CONTROL PANEL

- A. The system shall use an addressable RS485 communication protocol. Each sensor shall be sequentially polled by the Control Panel. Sensor data shall be acquired and stored in the Control Panel memory.
- B. The ACME CEL Series Multipoint System shall use only a common 4-wire 14 gauge communication link between the Control Panel and the local sensor stations.
- C. The Control Panel shall have an LED display with an indicating light for each sensor location. This light shall blink slowly for low-level indication, blink quickly for high-level indication and be solid ON for alarm level indication. A liquid-crystal alphanumeric 4-line display shall provide PPM levels for each sensor station, shall indicate the gas being sampled at that location and its alarm status.
- D. The Control Panel shall have a keypad for programming purposes and the programming shall be password protected.
- E. The system shall have all of its components, including the controller, RS-485 communication module and relay outputs boards in a single enclosure. Multiple enclosures requiring inter-wiring are not acceptable.
- F. The equipment shall be CSA and/or ETL certified.
- G. "ON - OFF" : The Control Panel shall incorporate the necessary logic circuits to operate the exhaust/supply fans and the motorized dampers for fresh air and/or exhaust according to the specified logic of ventilation. For example, if the equipment operated by the 100 PPM CO contacts does not reduce the CO level below this value within 30 minutes (3 to 60 minutes adjustable), the Control Panel shall go on visual and audible alarm and also provide a contact for remote alarm indication or supervision.

- H. CONSTRUCTION: The CEL Control Panel shall be of solid ventilated 16 gauge steel construction. All electronic components shall be behind a locked door. There shall be no accessible switches or knobs on front of panel (except for override if specified). All electrical connections should be made to clearly identified terminals.
- I. SELF-CHECKING: Integrity of the system shall be under constant checking. Should a remote station not confirm a response, a fault condition will be displayed at the Control Panel with indication of faulty station location. A common alarm shall be locked in.
- J. TIME DELAY: The Control Panel shall include a time delay of approximately 30 minutes scheduled between the time a High Level is detected and the time visual display on unit cover or panel, audible alarm and closure of alarm contacts. This time delay is introduced in order to avoid nuisance alarms produced by short temporary conditions. The time delay also allows the ventilation equipment, previously started at a lower gas level below alarm conditions, a reasonable length of time to reverse the gas trend.
- K. Control Panel shall be capable of monitoring up to 20 sensors and controlling up to six ventilation zones (outputs signals). Each sensor shall be capable of controlling the activity of a specific zone, all zones or any combination of zones.

3.03 SENSOR STATIONS

- A. The wall or column mounted metal or PVC gasketed enclosure with vandalproof cover screws or a lockable clasp and shall not have any parts accessible from outside.

3.04 RESPONSE

- A. The local reaction time of the remote stations shall be in the order of a few minutes therefore avoiding unnecessary start-stops of ventilation equipment every time a car happens to stop in the vicinity of the sensor.
- B. The sensor's response to ambient conditions shall be interpreted by the detection circuitry according to selected levels. Information is converted for transmittal to Control Panel at scanning time.
- C. CO Sensor/Transmitter stations shall have LED's for visual indication of "Power-On", and an LED bar graph indicating concentration levels.
- D. Removing or disconnecting a local sensor station from the system shall not affect its operation as long as the "daisy-chain" connection to the other sensor stations is maintained.
- E. There shall be no maintenance required except for periodic simple calibration checks performed by introducing a known gas mixture into the sensor and verifying or adjusting the electronic response at the sensor location.
- F. CO Metal Oxide Semiconductor (MOS) sensors shall have a life expectancy of 5 years. NO2 and other Electrochemical Cell sensors shall have a life expectancy of two years.

3.05 INSTALLATIONS

- A. Wiring: The interconnections between the Control Panel and Sensors shall be made by a required number of branches consisting of 4 conductor 14 gauge wires. Each branch shall support a total length of 800ft and a maximum of eight (8) sensors. For CO remote sensor stations must be mounted vertically according to the arrow on the sensor. Heights between 4 ft. (1.20 m) and 6 ft.(1.80 m) are usual. For NO2 (Diesel Fumes): remote sensor stations must be mounted vertically according to the arrow on the sensor. Install NO2 sensors at heights between 1 foot and 18 inches below the ceiling.
- B. CEL systems should be energized at all times. Supply 120/1/60 - 15A from dedicated circuit. It should be impossible to disconnect power to a CEL system in order to service other equipment.
- C. All equipment shall be interconnected at the factory and shipped factory calibrated after a 7-day operational test. The logic of the system shall be factory tested by simulated field conditions as

specified. A report shall be furnished with the equipment.

- D. All electrical connections shall be made by the contractor according to diagrams shown on drawings furnished with the equipment by the manufacturer. Use 4-wire coded cable from station to station, maintaining color code. All wiring is low voltage (24V). All wiring to be in conduit.

3.06 OPTIONS

- A. Provide on Control Panel selector switches with pilot lights to manually override all of the fans controlled by the system.
- B. Provide in CEL Control Panel a battery back-up to maintain the system in operation during a power failure. A compact rechargeable battery shall be used because of the reduced power requirement of the CEL system.
- C. Provide a Remote Alarm Station furnished with Audible/Visual alarm with silencing button.
- D. Provide a 4-20 ma or 0-10V DC analog output signal based on the highest condition or on the average of conditions detected.
- E. After complete installation, a manufacturer's representative shall check the installation before the system is started. A written report shall be submitted to the engineers, contractor & owner.

3.07 OTHER ACCEPTABLE MANUFACTURERS

- A. Provide acceptable equipment as manufactured and provided by Macuro, Toxalert, Brasch or Belimo

END OF SECTION

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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.
- D. Section 26 28 13 - FUSES: Fuses for fusible switches and spare fuse cabinets.

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 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- 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 KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- 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 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 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. Fully Rated Systems: Provide circuit breakers with interrupting capacity 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.

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

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**SECTION 26 27 01
ELECTRICAL SERVICE ENTRANCE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Permanent electrical service

1.02 RELATED REQUIREMENTS

- A. Section 26 24 16 - Panelboards

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 SYSTEM DESCRIPTION

- A. System Characteristics: 208Y/120 volts, single phase, two-wire, 60 Hertz.
- B. Service Entrance: Electrical contractor to provide conduits from service pedestal at utility pole base to meter as indicated on the Drawings.

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 Underwriters Laboratories Inc. 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 2 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. Provide secondary feeders from utility pedestal at base of utility pole to building panelboard. Turn conduits up at utility pedestal, coordinate work with utility company prior to rough-in. Primary connections to the utility pedestal by the utility company, secondary connections to the utility pedestal by the Electrical Contractor.
- B. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
- C. 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

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SECTION 26 27 26 WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.

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.
- C. Provide two protective rings.

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 GFCI protection for receptacles installed within 6 feet of sinks.

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: as indicated on the 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 20 and where applicable FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Wall Switches: Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
 - 1. Body and Handle: Gray, 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 498 and where applicable FS W-C-596; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 - 2. NEMA configurations specified are according to NEMA WD 6.
- B. Receptacles: Heavy duty, complying with NEMA WD 6 and WD 1.
 - 1. Device Body: Gray, 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, or Cooper ArrowLink.

- D. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

2.06 CORD REELS

- A. Manufacturers
 - 1. Legrand
 - 2. Hubbell
 - 3. Reelcraft
 - 4. Substitutions: See Section 01 6000-Product Requirements.
- B. Cord Reels
 - 1. Provide a Legrand model CRCD123N50R20 for every cord reel in shop areas as shown on Drawings.
 - a. 12/3 50 foot retractable cable.
 - b. 20A, 125-Volt slip ring, six foot leader cord and adjustable ball stop.
 - c. Duplex receptacle box.
 - d. Mountable on ceiling.
 - e. Rated for indoor use.
 - f. Black molded nylon construction with reinforced steel frame and long-life spring.
- C. Installation
 - 1. For every connection to the cord reel, provide an electrical connection from the source of power to the location of each cord reel. Connection required to be in EMT conduit and run tight against or parallel to the roof/deck support structure. Install junction box for each connection on the ceiling/support structure above the equipment/device location. Provide a 120V, 20 amp receptacle in the junction box to properly connect each cord reel plug.
 - 2. Install products in accordance with the manufacturer's instructions.
 - 3. Install each cord reels plumb and level with sections aligned with horizontal runs at the proper elevation.
 - 4. Cord Reel Support:
 - a. Use manufacturer's recommended hangers and supports, located at intervals complying with NFPA 70 and manufacturer's requirements. Provide required support and attachment components in accordance with Section 26 05 29, where not furnished by cord reel manufacturer.
 - b. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

2.07 TECHNOLOGY OUTLETS

- A. Provide rough-ins as indicated on the Drawings.

2.08 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.

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. Connect wiring device grounding terminal to outlet box with bonding jumper.
- S. Install standard plates on switch, receptacle, and blank outlets in finished areas.
- T. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- U. Install protective rings on active flush cover service fittings.

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.

END OF SECTION

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**SECTION 26 28 13
FUSES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fuses.

1.02 REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Submittal Procedures.
- B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1.04 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 and with service facilities within 100 miles of Project.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 MAINTENANCE MATERIALS

- A. See Section 01 6000 - Product Requirements for additional provisions
- B. Furnish two fuse pullers.
- C. Furnish three of each size and type fuse installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Bussman.
- B. LittellFuse
- C. Edison Fuse
- D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FUSES

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.

- G. Main Service Switches Larger than 600 amperes: Class L (time delay).
- H. Main Service Switches: Class RK1 (time delay).
- I. Power Load Feeder Switches Larger than 600 amperes: Class L (time delay).
- J. Power Load Feeder Switches: Class RK1 (time delay).
- K. Motor Load Feeder Switches: Class RK1 (time delay).
- L. Lighting Load Feeder Switches Larger than 600 amperes: Class L time delay.
- M. Lighting Load Feeder Switches: Class RK1 (time delay).
- N. Other Feeder Switches Larger than 600 amperes: L time delay.
- O. Other Feeder Switches: Class RK1 (time delay).
- P. General Purpose Branch Circuits: Class RK1 (time delay). Class J is also acceptable.
- Q. Motor Branch Circuits: Class L time delay.
- R. Lighting Branch Circuits: Class G.

2.03 CLASS RK1 FUSES

- A. Fuses "0 through 600" amperes shall be U.L. Class "RK1" and of the current limiting, dual element type, U.L. approved for 200,000A RMS, symmetrical interrupting capacity. They shall have a silver sand short circuit element, and shall carry 500 percent of rating for a minimum of 10 seconds on overloads. Fuses shall be Buss Low-Peak fuses, type "LPS/RK" or "LPN/RK" as required, except as otherwise denoted on the Drawings.
 - 1. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.
- C. Install spare fuse cabinet in boiler room.

END OF SECTION

**SECTION 26 28 16.16
ENCLOSED SWITCHES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fusible switches.
- B. Nonfusible switches.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 29 - HANGERS AND SUPPORTS.
- B. Section 26 28 13 - FUSES.
- C. 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 KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- 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. Fusible 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.
 - 3. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.

- B. 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.
- C. 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.
- H. Install fuses in fusible disconnect switches.
- I. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

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

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 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

2.04 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. B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

**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.
- G. Furnish products as indicated in Schedule included on the Drawings.
- H. Substitutions: See Section 01600 - Product Requirements.

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 recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- M. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Drawings.
- N. Install accessories furnished with each luminaire.

- O. Connect luminaires and exit signs to branch circuit outlets provided under Section 26 05 37 using flexible conduit.
- P. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- Q. Bond products and metal accessories to branch circuit equipment grounding conductor.
- R. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.
- S. 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

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**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.

1.07 EXTRA MATERIALS

- A. See Section 01 6000 - Product Requirements for additional provisions
- B. Furnish two of each type and wattage lamp installed.

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.
- 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

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Division 27

Communications

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**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. Power Strips (Two Post)
- D. Blank Panels

1.03 RELATED REQUIREMENTS

1.04 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 2019 OSDM:
 - 1. 27 2100 - Data Network Equipment
 - 2. 28 1601 - Access Control/Intrusion Detection
 - 3. 27 2300 - CCTV Camera System

1.05 SYSTEM DESCRIPTION

- A. The communication room fittings products provide the basic structure for mounting and installation of communication equipment.

1.06 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 two (2) Telecommunications Rooms
 - a. Existing Main Equipment Room LT Ball Intermediate
 - 1) Provide Main ER Fittings system in unit per Drawings, Schedules, and this Specification.
 - b. Telecommunications Room A107
 - 1) Provide TR Fittings system in unit per Drawings, Schedules, and this Specification.

1.07 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 2017 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.

1.08 ADMINISTRATIVE REQUIREMENTS

- A. 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.**
- 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.

1.10 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.

1.11 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 POWER STRIPS (TWO POST AND WALL MOUNT CABINETS)

- A. Provide horizontal power strip on each rack. Mount power strips near midpoint in the rack 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. (Provide extension/adapters as required). Power strip shall be equipped with an AC current meter.
 - 1. Strip to be connected to output of Rack UPS (provided by the Data Network Equipment Contractor).
 - 2. Approved Manufacturers 20A Power Strip:
 - a. Tripp-Lite PDUMH20
 - b. APC AP7801B
 - c. Cyberpower PDU20M2F10R
 - 3. Label Power Strip inputs with ANSI-606-B compliant labels as "UPS (30A)" and "Gen Only (20A)".

2.03 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. Rackrail shall be constructed of 11-gauge steel with tapped 12-24 mounting holes in universal EIA spacing with black powder coat finish.
- E. Rack shall include cable management.
- F. Rack shall be UL Listed in the US and Canada to the UL-2416 (NWIN) Category when used with bonding kit.
- G. Be manufactured by an ISO 9001 and ISO 14001 registered company.
- H. Rack shall be warrantied to be free from defects in materials or workmanship under normal use and conditions for the lifetime of the rack.
- I. Rack shall have 12RU of rack space and a usable depth of 30 inches.
- J. Provide grounding and bonding kit and bond to the TMGB.
- K. Approved Manufactures
 - 1. Basis of design: Chatswot Products - 11790-725
 - 2. Equals by: Panduit PanZone, Middle Atlantic, Tripp Lite

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 2017 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 GROUNDING AND BONDING

- A. All systems installed under these contracts shall comply fully with ANSI/TIA 607-C or 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.
 - 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 rack system to comply with the BICSI guidelines in the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual).

3.04 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

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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. Innerduct/fabric duct pathway
- C. Bonding & Grounding

1.03 RELATED REQUIREMENTS

1.04 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 2019 OSDM:
 - 1. 27 1323 - Communications Optical Fiber Backbone
- D. This Specification addresses backbone optical cabling required by equipment in the following sections from the 2019 OSDM:
 - 1. 27 2100 - Data Network Equipment

1.05 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. Single mode Fiber Optic Cabling
 - 3. Telecommunications Bonding and Grounding System

1.06 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 two (2) Telecommunications Rooms
 - a. Existing Main Equipment Room LT Ball Intermediate
 - 1) Provide wiring system in unit per Drawings, Schedules, and this Specification.
 - b. Telecommunications Room A107
 - 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.

1.07 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 2017 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.

1.08 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.

1.09 ADMINISTRATIVE REQUIREMENTS

- A. Refer to Division 1 Front-End documents for additional requirements.

1.10 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. Typical, 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.

1.11 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.

1.12 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.

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 existing 2" conduit to provide a minimum of two (2) 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
 1. Corning
 2. Comscope
 3. Hubbell
 4. Panduit
 5. Superior Essex
 6. Berk-Tek/Leviton
 7. General Cable

2.02 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-UPC type simplex couplers (blue in color) for each single mode fiber cable.
 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-UPC type simplex couplers (blue in color) for each single mode fiber cable
 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 2017 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 GROUNDING AND BONDING

- A. All systems installed under these contracts shall comply fully with ANSI J-STD 607-C revision 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. 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).
- F. 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.

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. Labeling Scheme
 - 2. Bonding/Grounding methods
 - 3. Fundamentals of Fiber Optic Cabling (patch cable routing, patch cable selection, rules to maintain channel warranty, etc)

END OF SECTION

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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
- D. Bonding & Grounding

1.03 RELATED REQUIREMEN

1.04 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 2019 OSDM:
 - 1. 27 1513 - Communications Copper Horizontal Cabling
- D. This Specification addresses horizontal cabling required by equipment in the following sections.
 - 1. 27 2100 - Data Network Equipment
 - 2. 28 1601 - Access Control
 - 3. 27 2300 - CCTV Camera System

1.05 SYSTEM DESCRIPTION

- A. The Ethernet System shall be capable of supporting 10/100/1000Mbps full-duplex transmission via 4-pr. Category 6 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 6 UTP Cabling
 - 2. Patch Panels
 - 3. Modular Jacks
 - 4. Telecommunications Bonding and Grounding System

1.06 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. Main Equipment Room LT Ball Intermediate
 - 1) Provide wiring system in unit per Drawings, Schedules, and this Specification.
 - b. Telecommunications Room A107
 - 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

1.07 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 2017 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.

1.08 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 6 Channel & Component Warranty

1.09 ADMINISTRATIVE REQUIREMENTS

- A. Refer to Division 1 Front-End documents for additional requirements.

1.10 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. Typical, 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.

1.11 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 6 Channel & Component Warranty

1.12 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.

1.13 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.
- 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 6 Cabling:
 - a. ADC AMP/Tyco - TrueNet series Components
 - b. Commscope - SYSTIMAX GigaSPEED CAT6
 - c. Panduit - MiniCom, and TX6 Series Components
 - d. Leviton/Remee - Extreme series
 - e. Hubbell - NEXTSPEED CAT 6 series components or Hubbell-Hitachi
 - f. Superior Essex - Superior Essex DataGain Cat6
 - g. Pangen -(includes General Cable) - PanGen 6 Enhanced
 - h. Berk-Tek/Leviton - LANmark 6
 - 2. 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 6 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(up to 37 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 6 performance. Maximum category 6 untwisting allowed is one half (1/2) inches, cable diameter .30 inches or less.
- C. All cable shall be plenum rated UNO.
- D. 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.
- E. Cable shall be component certified.
- F. Cable jacket color shall be:
 - 1. Data Network serving data outlets - Blue
 - 2. IP Telephone Network serving telephone outlets - Blue

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
- G. Standards:
1. Category 6 - Design bandwidth - 250 MHz cable bandwidth, standard data rate 1000 Mbps
- H. 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
- I. Testing Standard:
1. Category 6 - 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 6 - Patch panels must meet or exceed all transmission performance for Category 6 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 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 6 - The data jacks must be UL listed and must meet EIA/TIA 568 B.2.1, TSB-155 to 37 meters 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 in 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 - Blue
 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

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 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 demarc board per Technology Room Elevations in Main Equipment Room LT Ball Intermediate.

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:

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 6 - must meet ANSI/EIA/TIA 568 B.2.1, TSB-155 to 37 meters 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 of 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 6 - 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.2-10. All reports shall be recorded and presented to the Owner before acceptance
- H. Testing Standards:
 - 1. Category 6 - 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 and TSB-67, TSB -155 to 37 meters, and TIA/EIA-568B.2-1 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. 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.
 - 3. All reports shall be recorded and presented to the Architect/Engineer Technology Designer and Owner before acceptance.
 - 4. If horizontal cable contains bad conductors, remove and replace cable.
 - 5. Submit printout for each cable tested.
 - 6. 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 2017 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 of 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 GROUNDING AND BONDING

- A. All systems installed under these contracts shall comply fully with ANSI TIA J-STD-607-C, 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. 12 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. It is the responsibility of this contractor to provide grounding and bonding of the technology cabling system to comply with the BICSI guidelines in the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual).
- F. 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.

3.09 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.

**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. Standard 24/48 port data switches
 - 2. 24 port PoE switches
- B. Patch cables
- C. Uninterruptible power supplies (UPS's)

1.03 RELATED REQUIREMENTS

1.04 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 two (2) Telecommunications Rooms.
 - 1. Existing Main Equipment Room - LT Ball Intermediate
 - 2. Telecommunications Room 1 - A107

1.05 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.

1.06 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.

1.07 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.

1.08 ADMINISTRATIVE REQUIREMENTS

- A. Refer to Division 1 Front-End documents for additional requirements.

1.09 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.

1.10 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.

1.11 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.
- 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. Provide SM SFP+ modules at switch and core.
- 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 6
- 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. Dell SWS14-24FPOE
- O. Provide unit pricing.

2.02 UNINTERRUPTIBLE POWER SUPPLY (UPS)

- A. Provide dual conversion UPS units for each Telecommunications Room electronics and for the file server, provide sufficient protection from power anomalies.
- B. 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.
- C. Provide shutdown connections from the UPS to servers for graceful power down in the event of a power failure.
- D. Equip the UPS units with a twist-lock power cable and SNMP management card.
- E. Connect each UPS SNMP management to the management VLAN.
- F. UPS equipment sizing must be calculated by each bidder for the equipment bid.
- G. UPS equipment to be rack mountable.
- H. Coordinate with electrical contractor to install UPS AC outlets.
- I. Uninterruptible Power Supply (UPS)
 - 1. Provide UPS backup of all switches in each Telecommunications Room and for the file servers in the Main Equipment Room. Each Telecommunications Room rack to have a 2200VA UPS.
- J. Telecommunications Rooms
 - 1. Provide one (1) UPS per rack, 2200VA, RM-2U 120V online, 1- L5-30R out and 4 out 5 - 20R, RM/Tower
 - a. Approved Manufacturers:
 - 1) Vertiv-Liebert GXT5-2200RT120
 - 2) Tripp Lite SMART2200RM2U
 - 3) Eaton 9PX2200RT
 - 2. Provide one (1) rack mounting kit per UPS.
 - 3. Provide one - 10/100 Mbit Ethernet SNMP Kit.
 - a. Approved Management card manufacturers:
 - 1) Vertiv-Liebert GXT4-2200RT120
 - 2) Tripp Lite SMART2200RM2U
 - 3) Eaton 9PX2200RT

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 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 2017 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 four (4) 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

Division 28

Electronic Safety and Security

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**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 RELATED REQUIREMENTS

1.04 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
- E. **This system must integrate with the CCTV system division 28 2300 using ONVIF standards.**

1.05 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 2017 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.

1.06 ADMINISTRATIVE REQUIREMENTS

- A. Refer to Division 1 Front-End documents for additional requirements.

1.07 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.

1.08 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.

1.09 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following for Security:
 1. P&R Communications -
 2. -No substitution requests allowed
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following for Access Door Control:
 1. Avigilon - Basis of Design
 2. I/O Prox
 3. H.I.D. Corp.

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 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 Cellular Module with external antennas capable of running on VZW and LTE cellular networks 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. 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. Alarm Horns
 - 1. Alarm horns shall be dual tone output, tamper proof and weather resistant Amseco Corp.
 - 2. Provide alarm bells in locations as indicated on the Drawings.

K. 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.

L. 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.

M. Relay contacts for Distributed Antenna System (DAS) Monitoring

1. Provide cabling and contact interfaces for up to eight (8) alarm contacts from the radio enhancement system (DAS) in the Main Equipment Room.

2.02 ACCESS CONTROL SYSTEM

A. Access Control

1. Provide web based software, Enterprise Security Management System, that allows access from any internet connection. The system supports the addition of up to 512 card readers. Card access panels shall be mounted above each access controlled door and shall be connected via Ethernet.
2. Provide a rack-mount PC server with system software loaded. (Enterprise System). Mount server in rack that is provided by others. Provide a cable to the IP KVM (KVM provided by others). Provide initial programming per Owner's direction. Provide complete programming, hardware and software required for remote web access to system. This installation and setup shall conform to the owner's IP security scheme for firewalls and virus software. Coordinate with the owner's technology department.
 - a. NOTE: A virtual machine on a new infrastructure server will be available to install Access Control software systems with one (1) VM available for this purpose. The PC server requirement is waived provided the contractor successfully implements the system onto this virtual machine, The contractor will be required to provide their own Windows Operating system. The only physical interface permitted is the Ethernet interfaces on the primary hardware.
3. Access control modules shall accept proximity readers, magnetic stripe readers, and 26 bit Wiegand readers.
4. 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.
5. Provide software and hardware so the system shall be capable of a triple swipe/double tap feature (of Event Access control reader by authorized users) to unlock and secure preprogrammed venues.
 - a. Gymnasium Events
 - b. Sports Practices
 - c. Auditorium/Auditeria Events
 - d. Emergency unlock facility-wide exterior doors (for Fire and LEO AHJs)
6. Provide a scheduling application which permits the creation of 255 unique access control door scenarios with unlimited naming and copying of schedule events that trigger one or

- more door scenarios.
- a. Provide unlimited number of scheduled actions. Expired scheduled actions are removed automatically
7. 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 2017 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 eight (8) hours training for owner's personnel on the operation, programming and maintenance of the system.
- 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

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**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 extend the existing IP based CCTV security system for the building project. 24054.02 Tipp City Schools New Bus Maintenance Building. The equipment shall consist of but not limited to the following:
 - 1. Installing owner furnished Fixed Exterior Cameras and all Associated Wiring
 - 2. Exterior Pole Mount Components and all Associated Wiring
 - 3. Installing owner furnished IP Interior Cameras and all Associated Wiring
- 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 2017 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. Avigilon
- 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. Refer to Division 1 Front-End documents for additional requirements.

1.05 RELATED REQUIREMENTS

1.06 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.

1.07 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. Avigilon

2.02 OUTDOOR 180/27/360 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. The dome shall be capable of 10 simultaneous viewing/recording streams per camera.
- I. Programmable tilting 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.
- J. Museum search feature shall scan hours of video in minutes.
- K. MD5 128-bit algorithm video authentication shall ensure data integrity.
- L. The LAN interface shall be 1000 Mbps, TCP/IP unicast.
- M. Video bandwidth shall be less than 10 Mbps (per video stream), nominal.
- N. Adjustment of fps according to network performance capability shall not sacrifice quality.
- O. An embedded self-supported OS shall be provided.
- 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).
- Q. Approved Manufacturers 180 degree cameras:
 - 1. Avigilon
- R. Approved Manufacturers 270/360 degree cameras:
 - 1. Avigilon

2.03 OUTDOOR POLE MOUNT CAMERA COMPONENTS

- A. Pole mount Cameras with an approved pole mount adaptor/housing. Shall be fed via 50 micron multimode fiber. Provide needed fiber cables, patch panels, patch cables, and electronics (transceivers, encoders, power supplies, etc.) to interface camera to Ethernet port of the serving Ethernet switch per Drawings.
 - 1. Provide appropriate Ethernet transceivers for the operating environment or provide environmental control to keep electronics in operating range specified by the manufacturer.
 - a. Provide shelf in rack for encoders/transceivers that are not rack mountable and secure appropriately.
 - 2. All fiber is to be routed to the Main Equipment Room in conduit provided by Division 26.
 - 3. Provide NEMA 3R rated lockable enclosures (keyed alike) painted to match pole if pole base space (specifically allocated for CCTV electronics) is insufficient to house remote electronics.
 - 4. Fiber Specifications
 - a. Fiber Optic Cable
 - 1) The fiber optic cable shall be a multimode 50/125 micron fiber. The fiber are stranded with aramid yarn, which provides cable tensile strength and impact resistant. The fiber cable is jacketed with fluoropolymer and is UL listed for plenum applications and shall comply with EIA/TIA-455, ICEA and Bellcore standards. Terminate with fusion-spliced, factory-polished, SC Pigtails.
 - 2) Cable Specifications

(a) Number of Strands	=	"2", "4", "6", "12", "24" as specified
(b) Type of Fiber	=	Glass graded index
(c) Coating Material	=	PVC
(d) Maximum attenuation	=	3.75 dB/Km at 850 nm
(e) Minimum Bandwidth	=	400 mHz -Km at 850 nm
 - 3) Cable Construction

(a) Strength member	=	Aramid yarn
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- (b) Jacket material = Fluoropolymer
- (c) Non-Plenum rated
- (d) Provide innerduct - plenum rated
- 4) Physical Properties
 - (a) Cable Weight = 18 lb/1000, 25lb/1000, 90lb/1000
 - (b) Maximum tensile load = 200 lbs, 300 lbs, 400 lbs
 - (c) Minimum Bend Radius = Per manufacturer recommendations
 - (d) UL/NEC rating = Type OFNG
- 5) Standard: Corning Cable Systems
- 6) Approved Equal: Optical Cable Corp, Commscope, Mohawk, Berk-Tek, Superior Essex
- 7) Multimode Fiber Patch Cables - Standard: ADC PAT-CLM5UQ-XXXMPT
- 8) Approved Manufacturers:
 - (a) ADC/Tyco - TrueNet series Components
 - (b) Commscope
 - (c) Panduit - NetKey, MiniCom, and TX6 Series Components
 - (d) Leviton/Mohawk
 - (e) Hubbell - NEXTSPEED Ascent series components
 - (f) Berk-Tek/Ortronics
 - (g) Superior Essex
 - (h) Pangen
 - (i) AMP
- 5. Fiber Optic Patch Panels
 - a. Fiber-optic patch panels shall be mounted in equipment racks.
 - b. Fiber-optic patch panels shall be rack-mounted and shall not exceed one (1) rack unit in height.
 - c. Provide "Dual SC" type couplers for multimode cables.
 - d. Ports shall be aqua in color.
- 6. Fiber Optic Connectors
 - a. Multi-mode
 - 1) Terminate multimode fibers with factory-terminated SC laser optimized multi-mode pigtailed that support 1Gbs operation.
 - 2) Match fiber cable type provided.
 - 3) Connectors shall be aqua in color.
- 7. Fiber Optic Splice Trays
 - a. Provide fiber-optic fusion splice trays for connecting the factory terminated, SC pigtailed to the associated multimode fibers.

PART 3 INSTALLATION

3.01 INSTALLATION

- A. All cameras are owner furnished and contractor installed, unless noted otherwise. Provide wall and/or pole mounts and accessories as required to install cameras. Coordinate the procurement of the owner furnished cameras with the owner.
- B. Network cabling for cameras mounted inside and/or on the building will be provided by the 27 15 13 contractor. It is this contractors responsibility to provided extended reach power and fiber optic cabling for pole mounted cameras.
- C. All cameras are to be set to record on motion unless noted otherwise.
- D. The contractor's commencement of equipment installation indicates acceptance of the telecommunications infrastructure and conditions.

- E. 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.
- F. 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.
- G. All penetration of floor slabs and firewalls shall fire stopped in accordance with all local fire codes.
- H. All wiring shall meet the 2017 National Electrical Code standards. All camera system related patch cables shall be GREEN in color and be channel approved.
- I. The horizontal cabling provided will be terminated with modular jacks at the camera locations. Provide patch cables to connect to the horizontal cabling.
- J. 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.
- K. Power requirements determined by actual equipment used.
- L. Provide required power outlets, interconnecting cables, hardware and equipment for a complete and operable system.
- M. Power is PoE only.
- N. Each cable shall be individually home run from the device to the control room.
- O. Install cameras in the general vicinity of locations indicated on Drawings at final locations defined by camera location test.
- P. 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.
- Q. 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.
- R. All excess length AC cords are to be tied out of the way with Velcro straps (neutral color)
- S. Cable ties to be trimmed with flush-cut type pliers to avoid sharp edges (outdoor use only).
- T. All rack-mounted equipment and blank panels are to be installed using the black nylon washers provided with the mounting screws.
- U. 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.

3.02 TRAINING

- A. Provide four (4) hours of training on the provided systems/products with the district personnel.
- B. Refer to Submittal section of this Specification for training syllabus requirements.
- C. Provide two (2) video copies of all training.

3.03 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

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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.
- B. Refer to Section 01 2300 for Alternatives that may affect the Work of this Section.

1.02 SUMMARY

- A. Provide labor, material, equipment, and accessories necessary for a complete operable, electronically operated fire alarm system as indicated on the 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 programming 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 addressable fire alarm and detection system, model number FX-3318 manufactured by Mircom equals by Notifier, Simplex, Secutron, EST, Siemens. The FACP shall be capable of supporting up to 318 addressable devices.
 - 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 speakers 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.
 - 5. Provide non-electric graphic annunciator(s) with building floor plans engraved on plexiglas panel (color, scale, and room numbers to be selected by the Architect/Engineer). Floor Plan shall clearly indicate all areas of the building. Refer to Drawing for annunciator locations and quantities.

6. Provide wall surface mounted Electromagnetic Door Holders 2088-9582 or floor mounted 2088-9573 for single or for double doors, as shown on the Drawings.

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. 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.
- J. Door Holders.
1. Provide surface mounted electromagnetic door holds where indicated on the Drawings.
 2. Provide the necessary extenders where conflicts arise with door hardware, existing walls or any conflicts preventing the door holders from reaching the magnet.

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. Doors with hold open devices shall be signaled to release.
 - 7. Sound a continuous alarm over all signals and activate the associated flashing light.
- 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.

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

Division 31

Earthwork

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**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. Protection of vegetation to remain and repair work for construction damage. Work to be completed in accordance with approved nursery standards.
- D. Trimming and shaping of existing vegetation to remain.
- E. Removal of existing debris.
- F. Plant material removal meeting.

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 22 00 - Grading: Topsoil removal.
- E. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.
- F. Section 32 93 00 - Plants: Relocation of existing trees, shrubs, and other plants.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-clearing Meeting: Convene a pre-clearing meeting two weeks before starting work of this section; require attendance by all relevant contractors, subcontractors, and owner's representative.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Site Plan Showing:
 - 1. Vegetation removal limits.
 - 2. Areas for temporary construction and field offices.

1.05 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. Do not begin clearing until vegetation to be relocated has been removed and all vegetation has been inventoried as noted below.
- C. In areas where vegetation must be removed but no construction will occur, remove vegetation with minimum disturbance of the subsoil.
- D. 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.
- E. 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

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**SECTION 31 22 00
GRADING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal of topsoil.
- B. Rough grading the site for building pads and site improvements.
- C. Topsoil amendment and Finish grading.

1.02 RELATED REQUIREMENTS

- A. Section 31 10 00 - Site Clearing.
- B. Section 31 23 16 - Excavation.
- C. Section 31 23 23 - Fill.
- D. Section 32 92 19 - Seeding.

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 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Ohio Highway Department, County, or municipality standards.
 - 1. Maintain one copy of standards on site in job trailer.

1.05 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 - Soil Type
 - 1. Lawn: Topsoil Amended with Fertilizer and Soil Conditioners
- B. All Topsoil
 - 1. Graded.
 - 2. Free of roots, gravel overages, rocks larger than 3/4 inch, subsoil, debris, large weeds and foreign matter.
 - 3. Topsoil must be amended and conditioned to be capable of sustaining vigorous plant growth with acceptable macronutrient and micronutrient levels per soil test results as determined by ASTM D5268.
 - 4. Specific amendments will be based on soil test results and type of area as indicated on site and landscape plans.
 - 5. 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%
- C. Soil Amendment Materials:

1. Amend topsoil to support lawn growth. Amendments may include, but are not limited to:
 - a. 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.
 - b. 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 30 to 1.
 - 2) Leaf-litter and yard waste sources only.
 - 3) Biosolid sources are unacceptable.
 - 4) Sources from EPA approved compost facility
 - 5) Most recent compost lab test results furnished to Landscape Architect prior to use as a soil amendment.
 - 6) Screened to three quarter inch.
 - c. Carbon-Based Soil Conditioner: Site One/Lesco Carbon Pro G or equal, minimum 47% carbon derived from pyrolyzed hardwood biochar, mycorrhizae fungi package derived from *Bacillus* spp.
 - d. Lime: Ground limestone, dolomite type, minimum 108 calcium carbonate equivalent percent carbonates; or Ground limestone, calcitic type, minimum 100 calcium carbonate equivalent percent carbonates.
 - e. Elemental Sulfur: Tiger-Sul Turf Blend or equal, 90% elemental sulfur
- D. 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 tree protection noted in 31 10 00 Site Clearing has been completed. Absolutely no work is to start without tree protection in place.
- D. 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. Notify utility company to remove and relocate utilities.
- E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
- F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- G. Amend topsoil as indicated in the Topsoil Test Report as noted below in Soil Amendments.

3.03 ROUGH GRADING

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

- D. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content.
- E. When excavating through roots, perform work by hand and cut roots with sharp axe.
- F. Grade areas adjacent to building to drain away from structures and to prevent ponding.
- G. See Section 31 23 23 for filling procedures.
- H. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.
- I. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- J. 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; remove remainder from site.
- B. 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. Pile depth not to exceed 8 feet
 - 4. Place, grade and shape stockpiles to drain surface water.
 - 5. 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 building and trench backfilling have been inspected.
 - 2. Verify subgrade has been contoured and compacted.
 - 3. Verify topsoil testing has been completed and any necessary amendments have been added and thoroughly mixed in.
- B. Remove debris, roots, branches, stones, in excess of 3/4 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify or till surface to depth of:
 - 1. Lawn - 3 inches
 - 2. In areas where vehicles, equipment, material laydown or stockpiling have compacted the soil, scarify or till surface to a minimum depth of 6". Areas shall be identified by field marking and/or mapping prior to scarifying or tilling. Owner's Representative shall verify locations prior to commencing work.
- D. Pulverize and place topsoil where required to level finish grade.
- E. Pulverize and place topsoil to the following compacted thicknesses:
 - 1. Areas to be Seeded with Grass: 6 inches.
- F. Place topsoil during dry weather.
- G. Remove roots, weeds, rocks, and foreign material while spreading.

- H. Near site improvements and existing vegetation spread topsoil manually to prevent damage.
- I. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- J. Lightly compact placed topsoil.
- K. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.07 SOIL AMENDMENTS

- A. Lawn Areas
 - 1. Carbon-Based Soil Conditioner:
 - a. Using a properly calibrated rotary spreader, apply at a rate of 10 pounds per one thousand square feet over the topsoil prior to finish grading.
 - b. Using a power rake, Harley Rake, or approved equal equipment, incorporate the material to a minimum depth of 2 inches in two directions.
 - c. Place and incorporate manually near site improvements to avoid damage to amenities, sidewalks, curbs, parking lots, or buildings.
 - d. Maximum use rate of 10 pounds per one thousand square feet.
 - 2. Fertilizer:
 - a. Using a properly calibrated rotary spreader, apply recommended fertilizer at rates indicated by approved recommendations based on soil test report.
 - b. Complete application after finish grading.
 - c. Maximum use rate of 1.5 pounds of nitrogen, phosphorus, and potassium per one thousand square feet.
 - 3. Lime:
 - a. Using a properly calibrated rotary spreader, apply recommended fertilizer at rates indicated by approved recommendations based on soil test report.
 - b. Maximum use rate of 25 pounds of calcitic or dolomitic lime per one thousand square feet.
 - c. Complete a minimum of 14 days prior to seeding or sodding turfgrass
 - 4. Elemental Sulfur:
 - a. Using a properly calibrated rotary spreader, apply recommended fertilizer at rates indicated by approved recommendations based on soil test report.
 - b. Maximum use rate of 5 pounds per one thousand square feet.
 - c. Complete a minimum of 14 days prior to seeding or sodding turfgrass.

3.08 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 from required elevation over 25 feet in any direction:
 - 1. Lawn - plus or minus 3/4"

3.09 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work the contractor will hire an arborist to trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Owner's Representative as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.10 FIELD QUALITY CONTROL

- A. See Section 31 23 23 for compaction density testing.
- B. Furnish records of soil amendments applied as part of O & M.
- C. Final inspection on levelness of finish grade subject to Owner's Representative approval prior to seeding or sodding. Contractor responsible to meet finish grades per contract documents.

3.11 CLEANING

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

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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 report; bore hole locations and findings of subsurface materials.
- B. Section 01 4000 - Quality Requirements
- C. Section 03 30 00 - Cast-in-Place Concrete.
- D. Section 31 22 00 - Grading
- E. Section 31 23 16 - Excavation
- 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; 2014.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design of structural fill under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Ohio.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where 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.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. 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.
- B. 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.
- C. 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.
- D. 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.
- E. 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
- F. Sand: Conforming in accordance with Ohio Department of Transportation Construction and Material Specifications
- G. 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. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. 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
 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. Fill up to subgrade elevation.
 5. 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.
 - 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 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.

3.08 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

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Division 32

Exterior Improvements

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**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
- B. Section 31 23 23 - Fill
- C. Section 32 12 16 - Asphalt Paving
- D. Section 32 13 13 - Concrete Paving

1.03 REFERENCE STANDARDS

- A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- B. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).
- C. 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.
- D. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.
- E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- F. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- G. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
- 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. Samples: 10 lb sample of each type of aggregate; submit to site for approval.
- C. Product Data: Provide data on weed barrier
- D. Materials Sources: Submit name of imported materials source.
- E. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- F. 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. 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.
- D. 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.
- E. 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.
- F. 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.
- G. 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 scheduled.
 - a. 8 inches minimum thickness for:
 - 1) Light Duty Paving
 - 2) Standard Duty Paving
 - b. 12 inches minimum thickness for
 - 1) Heavy Duty Paving.
 - c. 8 inches minimum thickness if not called out otherwise
 - 2. Compact to 95 percent of maximum dry density.
- B. Under Portland Cement Concrete Paving:
 - 1. Place course aggregate to a compacted thickness as shown.
 - a. 4 inches minimum thickness if not called out otherwise
 - 2. Compact to 95 percent of maximum dry density.
- C. Place aggregate in maximum 6 inch layers and roller compact to specified density.
- D. Level and contour surfaces to elevations and gradients indicated.
- E. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- G. 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

**SECTION 32 12 16
ASPHALT PAVING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cold milling of existing asphalt.
- B. Single course bituminous concrete paving.
- C. Multiple course bituminous concrete paving.
- D. Pavement Overlay Fabric.
- E. Surface sealer.
- F. Striping and Associated Markings.

1.02 RELATED REQUIREMENTS

- A. Section 31 22 00 - Grading.
- B. Section 31 23 23 - Fill.
- C. Section 32 11 23 - AGGREGATE BASE AND SURFACING.

1.03 REFERENCE STANDARDS

- A. Ohio Department of Transportation, Construction and Material Specifications
- B. AI MS-2 - Asphalt Mix Design Methods; 2015.
- C. AI MS-19 - A Basic Asphalt Emulsion Manual; Fourth Edition.
- D. ASTM D3549 -03 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens

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 State of Ohio Highways standard.
- 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 Specifications.
- 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 with the ASTM D 977 or ASTM 2397
 - 2. ODOT Item 408 bituminous prime coat at 0.04 gallon per square yard.
- F. Pavement Overlay Fabric
 - 1. Product: Petromat 4598, Amoco Fabric and Fibers Company, Austell, GA
 - 2. Acceptable Manufacturers:
 - a. Mirafi Construction Products, Pendergrass, GA,
 - b. PS Construction Fabrics, Berea, Ohio; www.constfabrics.com
 - c. Substitutions: See Section 01 6000 - Product Requirements
- G. 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 by PPG: EF Series, Fast Dry
 - c. Substitutions: See Section 01 6000 - Product Requirements
- H. 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 - PRIMER

- A. tack coat can be used against curbs instead of primer

3.07 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.

3.08 PLACING PAVEMENT OVERLAY FABRIC

- 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 so 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 tack coat cannot seep into cracks
 - 3. Cracks larger than 3/8 inch wide to be filled with emulsion slurry or commercial crack filler and allow to cure completely.
- C. Tack Coat:
 - 1. The tack 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.
 - 2. Application rate must be sufficient to saturate the fabric and to bond the fabric to the existing pavement.
 - 3. Application rate shall be a minimum of 0.08 to 0.09 gallons per square yard.
 - 4. Apply tack coat over area to be paved and extend beyond area by at least 3 inches.
 - 5. Apply tack coat between all fabric overlaps.
- D. Fabric Placement.
 - 1. The fabric shall be placed on the asphalt sealant as soon as practical and before the tackiness of the tack coat is lost.
 - 2. The fabric shall be placed as smoothly as possible to avoid wrinkles. Wrinkles severe enough to cause "folds" shall be slit and laid flat.
 - 3. The fabric shall be laid straight, within the sealant area.
 - 4. Longitudinal joints shall be made by overlapping the fabric one to three inches. Transverse joints shall be made by overlapping the fabric four to six inches. Additional tack coat shall be added to the joints as required.

3.09 PLACING ASPHALT PAVEMENT - SINGLE COURSE

- A. All areas in which paving fabric has been placed shall be paved during the same day.
- B. Install Work in accordance with Ohio Department of Transportation (ODOT) Construction and Material Specifications.
- C. Place asphalt within 24 hours of applying primer or tack coat.
- D. Compact pavement in accordance with Ohio Department of Transportation (ODOT) Construction and Material Specifications. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.10 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.

3.11 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 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.

3.12 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.

3.13 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.

3.14 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.

3.15 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.

3.16 SCHEDULE

- A. Heavy Duty Paving:
 - 1. Aggregate specified in Section 32 1123
 - 2. Intermediate Course: 2 1/2 inch average compacted thickness placed upon Prime Coat.
 - 3. Tack Coat: # 407 ODOT. Apply at the rate of 0.4 gallons per square yard.
 - 4. Surface Course: 1 1/2 inch average compacted thickness placed upon properly compacted Intermediate Course.
 - 5. Painting: All markings as indicated on the drawings.

END OF SECTION

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**SECTION 32 13 13
CONCRETE PAVING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete paving.
- B. Concrete structure collars (manhole, catch basins, drains).

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.
- F. Section 32 17 13 - Concrete Wheelstops.

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 (Reapproved 2009).
- D. ACI 305R - Guide to Hot Weather Concreting; 2010.
- E. ACI 306R - Guide to Cold Weather Concreting; 2016.
- F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.
- G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.
- H. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.
- I. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2021b.
- J. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- K. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019.
- L. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.
- M. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2018.

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 MOCK-UP

- A. Construct and erect mock-up panel for architectural concrete surfaces indicated to receive special treatment or finish as result of formwork.
 - 1. Panel Size: 8 x 8 feet minimum.
 - 2. Locate where directed.
- B. Accepted mock-up panel is considered basis of quality for the finished work. Keep mock-up exposed to view for duration of concrete work.
- C. Mock-up may not remain as part of the Work.

1.06 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.

1.07 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. Standard Duty Concrete: 4,500 psi 28 day concrete, 4 inches thick. light broom finish.
- C. Heavy Duty Pavement: 4,500psi 28 day concrete, thickness shown on the drawings, heavy broom finish.

2.02 FORM MATERIALS

- A. Form Materials: As specified in Section 03 10 00, comply with ACI 301.
- B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
 - 1. Thickness: 1/4 inch.

2.03 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 80 (80,000 psi) yield strength; deformed billet steel bars; unfinished.
- B. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; unfinished.
- C. Fabricated Bar Mats: Steel bar or rod mats per ASTM A184, using ASTM A615, Grade 60 steel bars.
- D. Dowels: ASTM A615/A615M, Grade 40 - 40,000 psi yield strength; deformed billet steel bars; unfinished finish.
- E. Hook Bolts: ASTM A307, Grade A threaded bolts.
- F. Bar Supports: Bolsters, chairs, spacers, supporting, and fastening reinforcement bars, welded with fabric and dowels in place. Manufacture supports according to CRSI's Manual of Standard Practice.

2.04 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 may be 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" or 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 Italcementi 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.

2.05 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

2.06 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.

2.07 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 REINFORCEMENT

- A. Place reinforcement at midheight of slabs-on-grade.
- B. Clean reinforcing of bond reducing material.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement to maintain minimum cover of reinforcement.
- D. Install weld wire fabric in length as long as practical. Lap adjoining pieces at least one full mesh and splices with wire. Off set laps of adjoining width to prevent continuous laps in either direction.
- E. Interrupt reinforcement at expansion joints.
- F. Place dowels to achieve pavement and curb alignment as detailed.

3.06 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. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
- E. 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.
- F. Consolidate concrete by mechanical vibrating equipment supplemented by rodding or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.

3.07 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 1/4 inch wide expansion joints at 20 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. Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiber strips into fresh concrete until top surface of strip is flush with concrete. Radius each joint edge with a jointer tool. Carefully remove strips after concrete has hardened. Clean groove of loose debris.
 3. Provide joints at five (5) feet intervals if not indicated.

3.08 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.

3.09 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- B. Maximum Variation From True Position: 1/4 inch.

3.10 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 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.

3.11 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.

3.12 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

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**SECTION 32 17 13
CONCRETE WHEELSTOPS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Precast concrete parking bumpers and anchorage.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Parking Bumpers: Precast concrete, complying with the following:
 1. Nominal Size: 7 inches high, 10 inches wide, 6 feet long.
 2. Profile: Manufacturer's standard.
 3. Cement: ASTM C150, Portland Type I - Normal; gray color.
 4. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
 5. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
 6. Air Entrainment Admixture: ASTM C260/C260M.
 7. Concrete Mix: Minimum 5,000 psi compressive strength after 28 days, air entrained to 5 to 7 percent.
 8. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
 9. Embed reinforcing steel, and drill or sleeve for two dowels.
 10. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
 11. Minor patching in plant is acceptable, providing appearance of units is not impaired.
- B. Dowels: Steel, unfinished; 1/2 inch diameter, 24 inch long, pointed tip.
- C. Adhesive: Epoxy type.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install units without damage to shape or finish. Replace or repair damaged units.
- B. Install units in alignment with adjacent work.
- C. Fasten units in place with 2 dowels per unit set in anchor adhesive.

END OF SECTION

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SECTION 32 31 13
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Posts, rails, and frames.
- B. Wire fabric.
- C. Barbed wire.
- D. Concrete.
- E. Accessories
- F. Cantilever sliding gates and gate hardware.
- G. Limestone Screenings.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.03 REFERENCE STANDARDS

- A. American Society of Civil Engineers ASCE-7 Wind Load Requirements..
- B. ASTM A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire; 2013.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- E. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a (Reapproved 2022).
- F. ASTM A428/A428M - Standard Test Method for Weight (Mass) of Coating on Aluminum-Coated Iron or Steel Articles; 2010 (Reapproved 2014).
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.
- H. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2023.
- I. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework; 2014.
- J. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2013.
- K. ASTM F1665 - Standard Specification for Poly(Vinyl Chloride)(PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used with Chain-Link Fence; 2008 (Reapproved 2013).
- L. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction; 2014.
- M. BHMA A156.3 - Exit Devices; 2020.
- N. CLFMI CLF-SFR0111 - Security Fencing Recommendations; 2014.
- O. CLFMI CLF 2445 - Product Manual; 1997.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

- C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.
- C. Comply with Chain Link Fence Manufacturers Institute "Product Manual".
- D. Provide Certificates:
 - 1. stating Gate is manufactured in compliance with F 2200
 - 2. stating the use of AWS D1.2 welding code

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Chain Link Fences and Gates:
 - 1. Master Halco; www.masterhalco.com
 - 2. Merchants Metals; www.merchantsmetals.com
 - 3. Gregory Fence; www.gregorycorp.com
 - 4. Substitutions: See Section 01 60 00 - Product Requirements
- B. Cantilever Sliding Gates:
 - 1. Master Halco; www.masterhalco.com
 - 2. Hoover Fence; www.hooverfence.com
 - 3. Tymetal Corp; www.tymetal.com/
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. ASTM A1011/A1011M, Designation SS; hot-rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi; zinc coating complying with ASTM F1043 and ASTM F1083.
- B. Concrete: Comply with Section 03 3000 Cast-in-Place Concrete.
 - 1. Footing: Concrete is to extend a minimum 6 inches below bottom of post with weep provided. Typical footing size as follows, if detail requires more, then detail shall prevail:
 - a. Intermediate posts: minimum 12 inch diameter by 3'-6" below grade.
 - b. End, corner, pull posts 6 feet and lower: minimum 14 inch diameter by 3'-6" below grade.
 - c. Gate posts 6 feet wide leaf and smaller: minimum 14 inch diameter by 4'-6" below grade.

2.03 COMPONENTS

- A. Framework:
 - 1. 10'-0" high fence and under
 - a. Line Posts: 2.38 inch diameter with .154 inch wall thickness
 - b. Corner and Terminal Posts: 2.88 inch diameter with .203 inch wall thickness.
 - 2. Over 10'-0" high fence
 - a. Line Posts: 2.875 inch diameter with .203 inch wall thickness
 - b. Corner and Terminal Posts: 4.0 inch diameter with .226 inch wall thickness.
 - 3. Gate Post: The following sizes for single swing gates or on leaf of double gate:
 - a. Gate leaf up to 6 feet wide:

- 1) Schedule 40, 2.875 inch diameter with .203 inch wall thickness
- 4. Top and Brace Rail: 1.66 inch diameter with .140 wall thickness, plain end, sleeve coupled.
- 5. Gate Frame: 1.66 inch diameter for welded fabrication.
 - a. Install pipe bracing as required to prevent gate from sagging.
- B. Fabric:
 - 1. General
 - a. 2 inch diamond mesh interwoven
 - b. Wire: 9 gage
 - c. Selvage:
 - 1) Top: Knuckle
 - 2) Bottom: Knuckle
 - 2. Tension Wire: 6 gage, 0.1920 inch thick steel, single strand.
 - a. Connectors: 12-1/2 gauge aluminum coated steel clips or 'Hog Rings' (11 gauge)
 - b. Spacing: Note to exceed 18 inches
 - 3. Tension Band (Bar): 3/16 inch thick steel by 5/8 inch wide and 1 inch less than full height of fabric.
 - 4. Tension Strap: 0.11 inch thick steel by 1 inch wide.
 - a. Spacing: One for each foot in height
 - b. Connection: 3/8 inch diameter carriage bolts
 - 5. Tie Wire: Aluminum alloy steel wire, 9 gage.
 - a. Spacing:
 - 1) Intermediate Post: Not to exceed 14 inches
 - 2) Top Rail: Not to exceed 24 inches

2.04 CANTILEVER SLIDING GATES

- A. Top Track Internal Roller Design in accordance with ASTM F1184, Class 2.
- B. Gate shall be fabricated using square aluminum members, ASTM B221, alloy and temper 6063-T6. Members shall be welded together forming a rigid one-piece frame integral with top track.
- C. Fabric:
 - 1. 2 inch diamond mesh interwoven
 - 2. Wire: 9 gauge
 - 3. Selvage:
 - a. Top: Knuckle
 - b. Bottom: Knuckle
- D. Finish:
- E. Gate leaf single opening
 - 1. Gate shall have a minimum counterbalance length of 50% opening width.
 - 2. Gate is to be designed to meet specified ASCE-7 windload requirements (30 mph typical) with the gate in the closed and latched open condition.
 - 3. Provide 2 track and wheel assemblies for each gate leaf. Gates over 27 feet) in single opening shall be shipped in 2 parts and field spliced with special attachments provided by manufacturer.
 - 4. Vertical uprights: 2 in. X 2 in. shall be made of aluminum welded to the gate frame, at spacing less than 50% of the gate frame height and spaced at equal sections.
 - 5. Square lateral support, 2in shall be welded to top horizontal rail.
 - 6. Bottom rail shall consist of 2 in. X 4 in. Aluminum.
- F. Top Track/Rail

1. Gate track system shall be keyed to interlock into gate frame member.
 2. Enclosed, combination one-piece track and rail, aluminum extrusion.
 3. Track to withstand reaction load of 2,000 lb.
- G. Gate Frame
1. shall include 2 adjustable galvanized steel cables (min. 1/4") per bay.
 2. fabricated from 6063-T6 aluminum alloy extrusions
 3. top member 3"x5" aluminum structural channel/tube and shall be keyed to interlock with keyed track member
- H. Truck Assembly:
1. Swivel type, zinc die cast, with 4 sealed lubricant ball bearing rollers, 2 in. in diameter by 9/16 in. in width, and 2 side rolling wheels to ensure truck alignment in track. Mount trucks on post brackets using minimum 5/8 in. diameter plated ball bolts with self-aligning capability and 1/2 in. shank. Design truck assembly to withstand same reaction load as track.
- I. Gate Hangers, Latches, Brackets, Guide Assemblies, and Stops:
1. Malleable iron or steel, galvanized after fabrication. Provide positive latch with provisions for padlocking.
- J. Bottom Guide Wheel Assemblies:
1. Each assembly shall consist of two 100mm (4 in.) diameter rubber wheels, straddling bottom horizontal gate rail, allowing adjustment to maintain gate frame plumb and in proper alignment. Attach one assembly to each guide post.
- K. Gate Posts:
1. Posts shall be 4 in. hot-dipped galvanized steel square sections weighing over 10.8 kg/m (7.04 lb/ft.) .
 2. Pipe shall have a minimum 1.8 ounce/ft zinc coating meeting ASTM F1234.
 3. Steel shall meet requirements of ASTM A500, Grade B with a minimum yield strength of 40,000 psi.
 4. Provide 1 latch post and 2 support posts for single slide gate and 4 support posts for double slide gates.

2.05 ACCESSORIES

- A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.
- C. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; fork latch with gravity drop and padlock hasp ; keeper to hold gate in fully open position.
- D. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp ; keepers to hold gate in fully open position.
- E. Limestone Screenings: Crushed limestone passing through 1/4 inch screen.

2.06 FINISHES

- A. Components (Other than Fabric): Aluminum coated at 0.40 ounces per square foot, when measured in accordance with ASTM A428/A428M.
- B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.
- C. Accessories: Same finish as framing.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567.
- B. Place fabric on outside of posts and rails.
- C. Set intermediate posts plumb , in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
- D. Line Post Footing Depth Below Finish Grade: ASTM F 567.
- E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F 567.
- F. Brace each gate and corner post to adjacent line post with horizontal center brace rail. Install brace rail one bay from end and gate posts.
- G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.
- H. Install center brace rail on corner gate leaves.
- I. Do not stretch fabric until concrete foundation has cured 28 days.
- J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- K. Position bottom of fabric 1/2 inches above finished grade.
- L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- N. Install bottom tension wire stretched taut between terminal posts.
- O. Do not attach the hinged side of gate to building wall; provide gate posts.
- P. Install hardware and gate with fabric to match fence.
- Q. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- R. Compact limestone screenings beneath fence, 6" depth (minimum) , 6" width, centered on fence.
 - 1. Compact to 95 percent of maximum dry density.

3.02 CANTILEVER GATE INSTALLATION

- A. Equipment in this section shall be installed in strict accordance with the company's printed instructions unless otherwise shown on the contract drawings.
- B. The gate and installation shall conform to ASTM F1184 standards for aluminum cantilever slide gates, Type II, Class 2.
- C. Ground clearance shall be 5 inches.

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Position: 1 inch.
- C. Do not infringe on adjacent property lines.

END OF SECTION

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**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. Hydroseeding, 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. Topsoil samples: Furnish two (2) soil analysis results made by a qualified independent soil testing agency stating percentages or organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant nutrient content of topsoil. First test shall occur as a representative sample of the soil stockpile (see 32 2200 Grading). Second sample shall occur after topsoil has been respread and prior to finish grading. Stockpiles and/or respread soil showing differences in physical characteristics require different topsoil to be tested separately.
- E. 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. Lawn
 - 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 Ryegrass: 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.
- B. Detention Basin Seed
 - 1. Creeping Red Fescue: 30% 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 Ryegrass: 30% 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.
- 3. Chewings Fescue: 20% 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.
- 4. Annual Ryegrass: 20% 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
 - 5. Oat or wheat straw, crimped, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
- 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. Remove debris, roots, branches, and stones in excess of
 - 1. Lawn: 1 inch
 - 2. Detention Basin: 1.5 inch
- D. 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) Lawn: 3/4 inch
 - 2) Detention: 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. Seeding on Lawn Areas
 - a. Vredo, TurfCo, Brillon, Land Pride or Approved Equal
 - 2. Hydroseeding 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. Straw at 4,000 pounds per acre and crimped in 2 directions after application
- 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. Lawn Areas: 10 pounds;
 - b. Detention Basin: 8 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. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Crimp or otherwise prevent blowing of mulch material (pin fabric, crimp, etc) Maintain clear of shrubs and trees.
- H. Apply water with a fine spray immediately after each area has been mulched. Saturate to 2 inches of soil.
- I. 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.
- J. Install Flexterra HP-FGM hydromulch, as recommended by the manufacturer, on seeded slopes with a gradient of 10 percent and greater.

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 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.

3.06 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 PROTECTION

- A. Cover seeded slopes where grade is 4 inches per foot or greater with Flexterra HP-FGM at a depth equal to or greater than 1/4 inch.

3.08 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 occurrence 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.

3.09 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 Owner's Representative 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 maintenance 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

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Division 33

Utilities

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SECTION 33 52 01
LIQUID FUEL DISTRIBUTION - GENERAL PIPING REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Provision of piping systems as detailed on Drawings and as specified herein.
- B. Related Sections:
 - 1. Section 33 56 13: Fuel-Storage Tanks

1.02 QUALITY ASSURANCE

- A. NFPA-30, Flammable and Combustible Liquids Code
- B. Material standards:
 - 1. UL listing of all products for use with gasoline and diesel fuel;
 - 2. Malleable Iron Threaded Fittings, Class 150 and 300;
 - 3. ASTM A53-94: Specifications for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses; and
 - 4. ANSI B31: American National Standard Code for Pressure Piping.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 PIPING SYSTEMS – GENERAL

- A. The following applies to all piping systems provide under this Contract, except where otherwise noted:
 - 1. Piping systems shall be installed with adequate provisions made for expansion and to prevent stresses on valves and equipment. Provide adequate pipe anchors and guides and support from structure.
 - 2. Pitch piping to drain and make provisions to drain piping to the satisfaction of Owner or A/E. Provide auxiliary drains where necessary.
 - 3. Provide unions or flanges at each final connection and at each piece of equipment. Piping shall be arranged and unions and flanges located to permit easy cleaning.
 - 4. Make connections to equipment as recommended by the manufacturer or as specified on Drawings.
 - 5. Piping shall be arranged in accordance with best standards of trade with risers plumb.
 - 6. Ball valves shall be sized appropriately for system and located as specified on Drawings.

END OF SECTION

**SECTION 33 56 13
FUEL-STORAGE TANKS**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Provision of a complete fueling system, including all items of equipment including tanks, piping, pumps, dispensers, shut-off valves, fittings, unions, etc.
- B. System shall consist of, but not be limited to, the following items: two double wall steel U.L.-142 listed aboveground fuel-storage tanks with multiple tank connections, vents, saddles for support, interstitial monitor port, crane lifting lugs, gauges, alarm, and pipe supports.
- C. Related Sections:
 - 1. Section 09 91 13: Exterior Painting

1.02 SUBMITTALS

- A. Refer to Section 01 33 00 for additional submittal requirements.
- B. Submit manufacturer's product data, installation details, and shop drawings for all pieces of equipment.
- C. Submit Contractor's Ohio State Fire Marshal's Office Tank Installer Certification (per OAC 1301: 7-9-11). Contractor shall have at least one certified tank installer on site during installation of aboveground storage tanks and associated components, including all Work of Section 33 56 13.
- D. **Safety Data Sheets** for materials and supplies listed in Hazard Communication Standard (29 CFR 1926.59) and new materials.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver material in its original shipping containers.
- B. Store material in original containers in a dry space off the ground, covered, and secured.
- C. Handle items to prevent damage to both equipment and finishes.

1.04 LICENSES, PERMITS, AND CERTIFICATIONS

Maintain current licenses, permits, and certifications as required by applicable federal, state, or local jurisdictions for Work of this Contract. Contractor is responsible for submittal and cost of all required licenses, permits, and certifications.

1.05 CERTIFICATE OF PLAN APPROVAL

- A. Submit Drawing(s) for Plan Approval to Ohio Department of Commerce, Division of Industrial Compliance and Division of State Fire Marshal. Obtain Certificate(s) of Plan Approval and associated Addenda and post them as required by Ohio Basic Building Code.
- B. Fees for plan examination(s) shall be included in Bid.

1.06 INSPECTION

- A. Work shall be inspected by Ohio Department of Commerce, Division of Industrial Compliance and Division of State Fire Marshal, by applicable Inspector noted on "Certificate of Plan Approval."
- B. Upon completion of Work, furnish to A/E a Certification of Inspection and Approval from said Inspector(s) before requesting final payment.
- C. Fee for all required inspections shall be included in Bid.

1.07 ORDINANCES, REGULATIONS, AND CODES

- A. Work shall be completed in strict compliance with federal, state, and local ordinances and regulations in force at time of execution of Contract including Ohio Basic Building Code and any local codes or ordinances as interpreted by local authorities having jurisdiction.
- B. Update of fuel dispenser weight and measures stickers shall be obtained from local authority at completion of Work.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A/E's design and estimate are based on equipment and manufactures listed in documents or, if compatible, equal.

2.02 ABOVEGROUND STORAGE TANK

- A. Storage tank shall be a UL-142 Flameshield double wall aboveground tank for storage of petroleum products at near atmospheric pressure. Size and number of tanks shall be provided as specified on Drawings.
- B. Primary and secondary tanks shall be manufactured in accordance with Steel Tank Institute standard for double wall design and meet SwRi97-04 2-hour fire test.
- C. Listed assembly shall meet requirements for "Protected" tank as defined by UFC Article 79 and "Fire resistant" tanks as defined by Underwriters Laboratories including impact resistance, ballistics protection, and hose stream resistance criteria.
- D. Tank shall consist of an inner steel wall, encased by lightweight thermal insulation material, and an outer steel wall.
- E. Outer steel wall shall be UL-142 listed for secondary containment and capable of providing a minimum 110 percent containment of the primary storage content.
- F. A legible UL-142 label shall be affixed to side of aboveground storage tank.
- G. Steel outer wall of tank shall be coated to prolong weather resistance and to further reduce maintenance needs.
- H. Storage tank and supports shall be delivered as a complete UL listed unit. Provide a minimum of 6-inch clearance from bottom of tank to top of concrete pad to provide adequate visual inspection of bottom of tank.

- I. Storage tank and supports shall meet requirements for seismic zone 2b per Uniform Building Code requirements.
- J. Tank shall be designed for use aboveground and include integral secondary containment, and provide a minimum 2-hour fire rating.
- K. Tank manufacturer shall provide detailed shop drawings for submittal to State Fire Marshal's Office.
- L. Permanent decal signs shall be provided to indicate tank contents and "No Smoking". Include decal or permanent signage to give operating instructions for dispenser and what to do in the event of an emergency. Signage shall meet Ohio Fire Code Requirements.
- M. Installation of aboveground storage tank shall meet requirements of Ohio Fire Code and NFPA-30 and 30A, for installation of a UL-142 storage tank.
- N. Tanks shall be coated on outer steel wall to prolong weather resistance by painting. Color shall be white.
- O. Provide a 30-year limited warranty against leakage from secondary containment tank, and failure of primary tank caused by cracking, breakup or collapse. A 30-year warranty that tank was fabricated in accordance with requirements of UL-142 aboveground storage tank manufacturing standards of Underwriter's Laboratories. A 1-year warranty against failure due to defective materials and workmanship for one year following date of delivery of tank to job Site.
- P. Tanks shall be provided as specified on Drawing(s).
- Q. 500 Gallon tank shall be furnished with galvanized stair platform (per Drawing).
- R. Tank Piping Connections: Welded in place standard screwed fittings with double tapped reducer bushings.
- S. Equal Manufacturers: Hamilton Tanks; Stanwade Metal Products, Inc.; and Modern Welding Company of Ohio.

2.03 PIPING AND FITTINGS

- A. Steel Pipe: ASTM A53, black steel schedule 40, threaded.
- B. Fittings: ANSI B16.3 screwed 150 lb black malleable iron.
- C. Piping material shall meet NFPA 30 requirements.

2.04 CLOCK GAUGE

Morrison Brothers Company Model 918. Clock style gauge with built-in high level warning alarm. Clock face shall read in gallons and be calibrated to tank size indicated on drawings. Equal Manufacturers: Franklin Fuel Systems and OPW Fuel Management Systems.

2.05 OVERFILL PREVENTION VALVE

Morrison Brothers Company Model 9095 A AST Overfill Prevention Valve, 2-inch size with 4-inch NPT. Provide necessary adaptors. Provide drop tube to proper length. Equal Manufacturers: Franklin Fuel Systems and OPW Fuel Management Systems.

2.06 EXTERNAL EMERGENCY VALVE

Morrison Brothers Company Model 346 DI. Ductile iron body, cap, seat, and wing arm, Viton encapsulated teflon o-ring, teflon gasket, and stainless steel spring. Threaded. Equal Manufacturers: Franklin Fuel Systems and OPW Fuel Management Systems.

2.07 DROP TUBE

Morrison Brothers Company Model 419 Series. Coordinate length with tank diameter. Equal Manufacturers: Franklin Fuel Systems and OPW Fuel Management Systems.

2.08 BALL VALVE

Apollo Series 70. Equal Manufacturers: Jomar, Morrison, OPW, Watts, Jenkins, Hammond, and Nibco.

2.09 SOLENOID VALVE

Solenoid valve shall be by Automatic Switch Company (ASCO), UL listed for combustion systems, all brass construction. Unit to be line size and AGA listed. Unit shall be normally closed (closed when de-energized). Unit shall have Viton seals. Equal Manufacturers: Morrison Brother Company, Franklin Fuel Systems, and OPW Fuel Management Systems.

2.10 DISPENSING EQUIPMENT

A. 10,000 gallon AST - Pump

1. **Fill Rite FR310V**, 115-230V AC remote transfer pump, 1" NPT outlet.
2. Shall be constructed of painted cast iron.
3. Shall have flow capacity of 35 GPM.
4. Shall be gasoline and diesel compatible and up to 15 percent by volume of ethanol, methanol, or MTBE. UL listed with NTEP Certificate of Conformance.

B. 500 gallon AST - Pump

1. Fill Rite FR713V, 115V AC remote transfer pump, 0.75" NPT outlet.
2. Shall be constructed of painted cast iron.
3. Shall have flow capacity of 20 GPM.
4. Shall be gasoline and diesel compatible and up to 15 percent by volume of ethanol, methanol, or MTBE. UL listed with NTEP Certificate of Conformance.

C. Dispensers

1. Fill Rite FR902CRU, 110V AC heavy-duty remote single-hose fuel dispenser, mechanical meter, and integral nozzle holder.
2. Mounting bracket shall be Fill Rite KIT902MB, constructed of powder-coated steel. Bracket shall be fastened to factory installed mounting lugs; coordinate locations of mounting lugs with tank manufacturer.

3. Cabinet shall be powder-coated steel.
4. Furnish with break-off valve, solenoid valve, easy to read mechanical display, hose, and nozzle.
5. Gasoline and diesel compatible and up to 15 percent by volume of ethanol, methanol, or MTBE. UL listed with NTEP Certificate of Conformance.

D. Unless specified otherwise, equal dispensers and pumps by Tokheim, Gilbarco, Gasboy, or Bennett may be provided at Contractor's option.

2.11 DISPENSER HOSE

Hose from the dispensing unit mounted on tank to the nozzle shall be Goodyear Model Flexsteel-Hardwall 1-inch size petroleum dispensing hose. Hose shall meet approval of UL 330 and ULC. Branding shall read: Goodyear 559N, Made in USA. 1" UL, ULC. Listed Flexsteel Hardwall Gasoline Hose. Cover shall be black. Hose length shall be 18 feet long. Equal Manufacturers: Morrison Brothers Company, Franklin Fuel Systems, and OPW Fuel Management Systems.

2.12 HOSE RETRIEVER

Pemco cast iron hose retriever Model 360P. Equal Manufacturers: Franklin Fuel Systems and OPW Fuel Management Systems.

2.13 OVERFILL ALARM

Omntec RAS-series remote annunciator with IB-RAS remote annunciator interface board. Equal Manufacturers: Veeder-Root Gilbarco, Franklin Fueling Systems and OPW Fuel Management Systems.

2.14 EMERGENCY VENTING

Morrison Brothers Company Model 244 series 6-inch size emergency vent with venting capacity as required for specific tank it is serving. Exact model of vent shall as required by tank manufacturer. Provide a primary and secondary emergency vent on aboveground tanks. Provide vent per manufacturer's recommendations. Equal Manufacturers: Franklin Fuel Systems and OPW Fuel Management Systems.

2.15 PRODUCT IDENTIFICATION TAGS

Provide 20 gauge stainless steel tags attached to fill pipe (not fill cap). Tag shall be large enough to be stamped with:

1. Tank number;
2. Fuel type;
3. Octane rating; and
4. Gallonage capacity of tank.

2.16 DISPENSER NOZZLE

OPW Model 7H automatic shut off nozzle. Nozzle shall automatically close and be for proper dispensing of gasoline or diesel fuel as required. Body shall be constructed of aluminum with Teflon packing and a Viton disc. Inlet size to be 1-inch NPT. Equal by Morrison Brothers Company, Gasboy, Bennett, Tokheim, or Gilbarco may be provided at Contractor's option.

2.17 COMBINATION VENT/OVERFILL ALARM

Morrison Brothers Company Model 922 combination 2-inch pressure vacuum vent overfill alarm. Equal Manufacturers: Franklin Fuel Systems and OPW Fuel Management Systems.

2.18 REMOTE FILL/SPILL CONTAINER

- A. 10,000 gallon AST - Morrison Brothers Company Model 515 remote steel spill container with 15-gallon capacity, lockable hinged cover and push drain. Equal Manufacturers: Franklin Fuel Systems and OPW Fuel Management Systems.
- B. 500 gallon AST - Morrison Brothers Company Model 518 steel spill container with 7.5-gallon capacity, lockable hinged cover and push drain. Equal Manufacturers: Franklin Fuel Systems and OPW Fuel Management Systems.

2.20 LEAK DETECTION SYSTEM

- A. Omntec Proteus-K OEL8000IIK4-5 Automatic Tank Gauging and Leak Detection System with printer. Equal Manufacturers: Veeder-Root Gilbarco, Franklin Fueling Systems and OPW Fuel Management Systems.
- B. Liquid Sensor: BX-LWS Series Liquid Float Sensor shall continually monitor presence of water or hydrocarbons inside interstitial space of storage tank.
- C. Inventory Probe: MTG-RS Series Magnetostrictive (MAG) In-Tank Probe for inventory control and shall monitor for presence of water.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install tank according to manufacturer's recommendations.
- B. Paint (per Section 09 91 13) all exposed piping and miscellaneous steel at tank. Color shall be white.

END OF SECTION