Spring Lake Park

History. Community. Home.

Project Manual For

Spring Lake Park City Hall Renovation/Expansion

Prepared for:

City of Spring Lake Park, Minnesota

Stantec

October 2023

Stantec Project No. 193806049

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SECTION 00 01 05

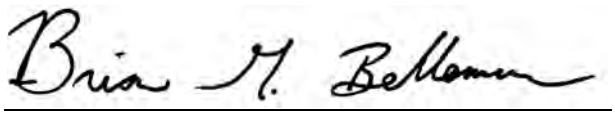
PROFESSIONAL CERTIFICATIONS

ARCHITECT
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Architect under the laws of the State of Minnesota. Responsible for Divisions 00, 01, 04, and 06 through 12 of the Specifications.

Bruce P. Paulson

Date: October 24, 2023 License # 20910

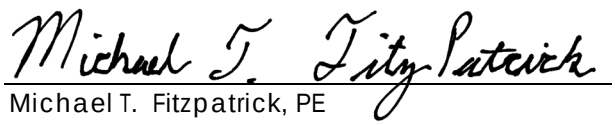
PROFESSIONAL ENGINEER
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota. Responsible for Divisions 03, 05 and 06 of the Specifications.



Brian G. Bellemare, PE

Date: October 24, 2023 License # 50378

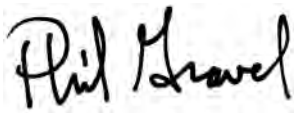
PROFESSIONAL ENGINEER
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota. Responsible for Divisions 26, 27, and 28 of the Specifications.



Michael T. Fitzpatrick, PE

Date: October 24, 2023 License # 53078

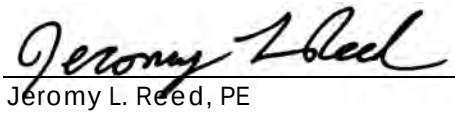
PROFESSIONAL ENGINEER
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota. Responsible for Divisions 31, 32, and 33 of the Specifications.



L. Phil Gravel, PE

Date: October 24, 2023 License # 19864

PROFESSIONAL ENGINEER
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota. Responsible for Divisions 21, 22, and 23 of the Specifications.



Jeromy L. Reed, PE

Date: October 24, 2023 License # 53856

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INVITATION FOR BIDS

Sealed Bids (faxes will not be considered Sealed Bids) will be received by the City of Spring Lake Park, Minnesota, in the City Hall at 1301 81st Avenue NE, Spring Lake Park, MN, 55432, until **2 P.M., CST, on Monday, November 20, 2023**, for the **Spring Lake Park City Hall Renovation/Expansion Project**, at which time and place the Owner, or their designated representative, shall publicly open and read aloud the Bids. Sealed Bids arriving after the designated time will be returned unopened.

In general, this Project will consist of renovations to and expansion of the Spring Lake Park City Hall building.

BIDS: To be considered, Bids must be sealed and addressed to City Clerk, City of Spring Lake Park, 1301 81st Avenue NE, Spring Lake Park, Minnesota 55432. Bids must be endorsed with the name and address of the Bidder and the Project Name for which the Bid is being submitted.

Complete digital Bidding Documents are available at www.questcdn.com for $20 by inputting **QuestCDN eBidDoc #7738550** on the website's Project Search page.

Direct inquiries to the Architect's Project Manager, Bruce Paulson, at (612) 712-2108.

A **MANDATORY Pre-Bid Meeting** will be held on Thursday, November 2, 2023, at 9:00 A.M., CST at Spring Lake Park City Hall, 1301 81st Avenue NE, Spring Lake Park, Minnesota 55432. All Contractors wishing to submit a Bid on this Project must attend this Pre-Bid Meeting. **This will be the only opportunity to tour the building prior to the Bid due date.**

BID SECURITY: No Bid will be considered which is not accompanied by a cash deposit, certified check, cashier's check, or satisfactory bid bond payable to the City of New Hope in an amount of not less than 5 percent of the Bid amount. Bids may not be withdrawn for a period of 60 days after the date and time set for the Opening of Bids.

The Owner reserves the right to retain the deposits of the 3 lowest Bidders for a period not to exceed 60 days after the date and time set for the Opening of Bids. No Bids may be withdrawn for a period of 60 days after the date and time set for the Opening of Bids.

The Owner reserves the right to reject any and all Bids, to waive irregularities and informalities therein, and further reserves the right to award the Contract to the best interests of the Owner.

The City Council will consider award of a Contract at its regular meeting to be held on Monday, December 12, 2023, in the City of Spring Lake Park Council Chambers, 1301 81st Avenue NE, Spring Lake Park, Minnesota 55432.

Daniel Buchholtz, City Administrator/Clerk
City of Spring Lake Park, Minnesota

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AIA® Document A701® – 2018

Instructions to Bidders

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

Spring Lake Park City Hall Renovation/Expansion
1301 81st Avenue NE
Spring Lake Park, MN 55432

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

City of Spring Lake Park
1301 81st Avenue NE
Spring Lake Park, MN 55432
Telephone Number: (763) 784-6491

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

Stantec Architecture Inc.
733 Marquette Avenue
Suite 1000
Minneapolis, MN 55402
Telephone Number: (612) 712-2000

TABLE OF ARTICLES

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

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

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

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

ARTICLE 1 DEFINITIONS

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

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

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

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

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

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

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

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

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

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

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

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

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

Bidding documents will be uploaded to QuestCDN per the Advertisement for Bids.

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

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

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

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

§ 3.2 Modification or Interpretation of Bidding Documents

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

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

Submit via email to bruce.paulson@stantec.com

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

§ 3.3 Substitutions

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

§ 3.3.2 Substitution Process

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

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

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

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

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

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

§ 3.4 Addenda

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

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

Addenda will be uploaded to QuestCDN per the Advertisement for Bids.

§ 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.)

Bid security in the amount of five (5) percent of the Bid must accompany each Bid.

§ 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 ninety (90) 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 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

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

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

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

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

DOCUMENT 00 21 13

SUPPLEMENTARY INSTRUCTIONS

The Supplementary Instructions to Bidders modify, delete, and/or add to the Instructions to Bidders AIA Document A701-2018. Where any article, paragraph, or subparagraph in the Instructions to Bidders is supplemented by one of the following articles, paragraphs, or subparagraphs, the provisions of such article, paragraph, or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any article, paragraph, or subparagraph in the Instructions to Bidders is not supplemented, amended, voided, or superseded by any of the following articles, paragraphs, or subparagraphs, the provisions of such article, paragraph, or subparagraph not so amended, voided, or superseded shall remain in effect.

ARTICLE 3 - BIDDING DOCUMENTS

A. Delete Subparagraph 3.1.1 in its entirety, and substitute the following:

3.1.1 Bidders and Sub-bidders may obtain complete sets of the Bidding Documents in the number and for the non-refundable sum stated in the Invitation for Bids from the Issuing Office identified in the Invitation for Bids.

B. Delete Subparagraph 3.1.2 in its entirety.

C. Delete Paragraph 3.3 in its entirety, and substitute the following:

3.3 SUBSTITUTIONS

3.3.1 Materials, products, systems, and equipment shown and described in the Contract Documents establish a standard of design, function, and quality to be met by any proposed substitution.

3.3.2 When a single manufacturer of material, product, system, or equipment is specifically named and specified, no substitution will be allowed.

3.3.3 When more than 1 manufacturer of material, product, system, or equipment is listed under the same heading, choice of those listed shall be the Bidder's option. One manufacturer may be identified and specified as reference to establish a standard of design, function, and quality; and when another is considered, the Bidder before purchase or use shall be expected to submit such data as may be necessary to prove equivalency to that specified. Consideration for equivalency is subject to approval of the Architect as accepting minor and normal variations from that specified. Should any part of associated construction be changed because of substitute acceptance, such changes shall be outlined by the proposer and the cost of such changes shall be included as part of the work of accepted substitute.

3.3.4 Optional products, systems, and equipment will be considered in accordance with Section 01 60 00, Paragraph 1.04.

ARTICLE 4 - BIDDING PROCEDURE

A. Delete Paragraph 4.2.1 in its entirety and substitute the following:

4.2.1 Each Bid must be accompanied by a Bid Security made payable to Owner in an amount of 5 percent of the Bidder's maximum Bid Price and in the form of a certified or bank check or a Bid Bond issued by a surety meeting the requirements of the General Conditions. The Bid Security of the successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required Contract Security, and met the other conditions of the Notice of Award, whereupon the Bid Security will be returned. If the successful Bidder fails to execute and deliver the Contract Documents and furnish the required Contract Security within 15 days after the Notice of Award, Owner may annul the Notice of Award and the Bid Security of that Bidder will be forfeited.

B. Delete Paragraph 4.4.1 in its entirety and substitute the following:

4.4.1 Bids may be withdrawn after Bid Opening only in accordance with the law.

ARTICLE 6 - POST-BID INFORMATION

A. Add the following to Paragraph 6.1: If the Architect requests the submission of a Contractor's Qualification Statement, AIA Document A305, said document shall be submitted within 10 days of request.

ARTICLE 7 - PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

A. Delete Paragraph 7.1.2 in its entirety and substitute the following:

7.1.2 The cost of bonds and insurance shall be included in the Bid.

B. Delete Paragraph 7.2.1 in its entirety and substitute the following:

7.2.1 The Bidder shall deliver the required bonds to the Owner when the Bidder delivers the executed Agreement to the Owner.

END OF DOCUMENT

BIDDER: _____

DOCUMENT 00 41 00

BID FORM

SPRING LAKE PARK CITY HALL RENOVATION/EXPANSION

PROJECT NO. 193806049

SPRING LAKE PARK, MINNESOTA

2023

THIS BID IS SUBMITTED TO:

City of Spring Lake Park
City Administrator
1301 81st Avenue NE
Spring Lake Park, MN 55432

1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid Security. The Bid will remain subject to acceptance for 60 days after the Bid Opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged:

Addendum No.	Addendum Date

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at, or contiguous to, the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at, or contiguous to, the Site (except Underground Facilities) which have been identified in SC-4.02, and (2) reports and drawings of Hazardous Environmental Conditions that have been identified in SC-4.06.

E. Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at, or contiguous to, the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) Bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

I. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

J. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

K. Bidder will submit written evidence of its authority to do business in the state where the Project is located not later than the date of its execution of the Agreement.

4.01 Bidder further represents that:

A. The prices in this Bid have been arrived at independently, without consultation, communication, or agreement as to any matters relating to such prices with any other Bidder or with any competitor for the purpose of restricting competition.

B. The prices in this Bid have not or will not be knowingly disclosed to any other Bidder or competitor prior to opening of the Bids.

C. No attempt has been made or will be made by the Bidder to induce any other person or firm to submit or not to submit a Bid for the purpose of restricting competition.

4.02 Bidder understands that the law may require the Owner, or Engineer at the Owner's direction, to undertake an investigation and submit an evaluation concerning Bidder's responsiveness, responsibility, and qualifications before awarding a contract. Bidder hereby waives any and all claims, of whatever nature, against Owner, Engineer and their employees and agents, which arise out of or relate to such investigation and evaluation, and statements made as a result thereof, except for statements that can be shown by clear and convincing evidence to be intentionally false and made with actual malice. Nothing in this paragraph is intended to restrict Bidder's rights to challenge a contract pursuant to law.

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

No.	Item	Units	Qty	Total Price
	PART 1 - BASE BID:			
1-1.	MATERIALS AND LABOR NECESSARY TO COMPLETE THE WORK AS DEFINED ON THE DRAWINGS AND IN THE PROJECT MANUAL	LS	1	$ _____
	TOTAL BASE BID			$ _____
	PART 2 - UNIT PRICES:			
2-1.	MATERIALS, EQUIPMENT, AND LABOR NECESSARY TO CONSTRUCT COLD STORAGE 184 AS INDICATED ON THE DRAWINGS AND IN THE PROJECT MANUAL	LS	1	$ _____
2-2.	MATERIALS, EQUIPMENT, AND LABOR NECESSARY TO PERFORM WORK SHOWN IN SHOOTING RANGE 186 AS INDICATED ON THE DRAWINGS AND IN THE PROJECT MANUAL	LS	1	$ _____

6.01 Bidder agrees that the Work will be Substantially Completed and completed and ready for Final Payment in accordance with Paragraph 14.07.B of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified above, which shall be stated in the Agreement.

7.01 The following documents are attached to and made a condition of this Bid:

A. Required Bid Security in the form of 5 percent.
B. 00 32 50 - Certification of Compliance of Responsible Contractors
C. 00 33 00 - List of Materials Suppliers

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

SUBMITTED on _____, 2023.

If Bidder Is:

A Corporation

Corporation Name: _____(SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature)

Name (typed or printed): _____

Title: _____

Attest _____ (CORPORATE SEAL)
(Signature of Corporate Secretary)

Business Street Address (No P.O. Box #'s):

_____

_____

Phone No.: _____ Fax No.: _____

Email: _____

An Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individual's signature)

Doing business as: _____

Business Street Address (No P.O. Box #'s):

_____

_____

Phone No.: _____ Fax No.: _____

Email: _____

A Partnership

Partnership Name: _____(SEAL)

By: _____
(Signature of general partner)

Name (typed or printed): _____

Business Street Address (No P.O. Box #'s):

_____

_____

Phone No.: _____ Fax No.: _____

Email: _____

END OF DOCUMENT

SECTION 00 41 73

CONTRACTOR QUALIFICATION FORM

This Contractor Qualification Form must be submitted with the Bid Form. Any response received without this form, or with an outdated version, may be rejected. Prime contractors are responsible for checking all addenda for the final version of this form.

Each responder must answer every question and provide all information requested on this form. Failure to submit a fully completed form may result in the rejection of the entire solicitation response as non-responsive.

The City of Waseca (or its representative) reserves the right to clarify the required qualification information submitted on this form before an award is made. The solicitation response will be rejected if qualifications are not met.

Qualification Requirements

1. Responding company has completed as a Prime Contractor or as a Subcontractor, the work for at least two (2) contracts which have achieved Substantial Completion since February 1, 2017, for construction of projects with similar scope, size and complexity. Each of these contracts for the Prime Contractor MUST have had a construction value of $2,000,000 or greater.

Fill in the required information for your previous projects relating to Qualification Requirement #1:

Project 1	
*Property Owner: Property Owner Contact Person and Number:	
Dollar Amount of Contract:	Substantial Completion Date:
Contract substantially completed under (check one):	☐ Current Company Name ☐ Previous Company Name

Project 2	
*Property Owner: Property Owner Contact Person and Number:	
Dollar Amount of Contract:	Substantial Completion Date:
Contract substantially completed under (check one):	☐ Current Company Name ☐ Previous Company Name

*Project 3	
Property Owner: Property Owner Contact Person and Number:	
Dollar Amount of Contract:	Substantial Completion Date:
Contract substantially completed under (check one):	☐ Current Company Name ☐ Previous Company Name

***The term "Property Owner" means the person or entity identified as the owner of the property where the work referenced for Qualification Requirement #1 was performed.**

The City of Spring Lake Park (or its representative) reserves the right to contact the references listed above for Qualification Requirement #1 or to request the Responder to provide additional reference projects for review. The solicitation response will be rejected if the City of Spring Lake Park, in its sole discretion, receives information that indicates the responder is non-responsible. Information considered includes, but is not limited to: 1) project milestones (meeting substantial and final completion dates); 2) communication with project owner and subcontractors; 3) on-site supervision; 4) coordination of subcontractors; 5) violation of Minnesota prevailing wage law; and 6) nonpayment of subcontractors.

2. Project Manager and Job Superintendent responsible for this project EACH has had at least five (5) years of experience with projects similar in scope and value to this project. Each of these contracts must have had a construction value of $2,000,000 or greater.

- Name of Project Manager assigned to this project: _____
- Years of Experience: _____
- Name of the Project Superintendent assigned to this project: _____
- Years of Experience: _____

3. Has your Company been found in default or had a contract terminated for cause within the last 36 months? It is required that your company has not had this occur. NOTE: If this question is answered as "yes", your solicitation response will be rejected.	☐ NO ☐ YES

4. Has your Company received from OSHA any willful or repeated safety citations for which a final order has been issued within the last 36 months? It is required that your company has not had this occur. NOTE: If this question is answered as "yes", your solicitation response will be rejected.	☐ NO ☐ YES

Certification

By signing this form, I certify the information provided is complete and accurate.

Authorized Signature: _____ Date: _____

Printed Name: _____ Telephone: _____

Company Name: _____ Title: _____

END OF SECTION

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AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

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

OWNER:
(Name, legal status and address)
City of Spring Lake Park
1301 81st Avenue NE
Spring Lake Park, MN 55432

BOND AMOUNT: $

PROJECT:
(Name, location or address, and Project number, if any)
Spring Lake Park City Hall Renovation/Expansion
1301 81st Avenue NE
Spring Lake Park, MN 55432

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

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

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

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

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

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so

furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this day of ,

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

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)

City of Spring Lake Park
1301 81st Avenue NE
Spring Lake Park, MN 55432
Telephone Number: (763) 784-6491

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

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

Spring Lake Park City Hall Renovation/Expansion
1301 81st Avenue NE
Spring Lake Park, MN 55432

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

Stantec Architecture Inc.
733 Marquette Avenue
Suite 1000
Minneapolis, MN 55402
Telephone Number: (612) 712-2000

The Owner and Contractor agree as follows.

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

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

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.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

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

[X] 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
Entire Work	June 13, 2025
Final Completion	June 27, 2025

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

ARTICLE 4 CONTRACT SUM

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

§ 4.2 Alternates

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

Item	Price

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

Item	Price	Conditions for Acceptance

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

Item	Price

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

Item	Units and Limitations	Price per Unit ($0.00)

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

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

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 25th day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the last day of the following 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 thirty-five (35) 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%

§ 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

[X] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

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

ARTICLE 7 TERMINATION OR SUSPENSION
§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

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

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

ARTICLE 8 MISCELLANEOUS PROVISIONS
§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

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

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

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

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

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

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

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

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

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

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

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

AIA® Document A312® – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

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

OWNER:
(Name, legal status and address)
City of Spring Lake Park
1301 81st Avenue NE
Spring Lake Park, MN 55432

CONSTRUCTION CONTRACT
Date:
Amount: $
Description:
(Name and location)
Spring Lake Park City Hall Renovation/Expansion
1301 81st Avenue NE
Spring Lake Park, MN 55432

BOND
Date:
(Not earlier than Construction Contract Date)

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

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

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

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 14 Definitions

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

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

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

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

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

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

§ 16 Modifications to this bond are as follows:

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

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

AIA® Document A312® – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

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

OWNER:
(Name, legal status and address)
City of Spring Lake Park
1301 81st Avenue NE
Spring Lake Park, MN 55432

CONSTRUCTION CONTRACT
Date:
Amount: $
Description:
(Name and location)
Spring Lake Park City Hall Renovation/Expansion
1301 81st Avenue NE
Spring Lake Park, MN 55432

BOND
Date:
(Not earlier than Construction Contract Date)

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

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

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

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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

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

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

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

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

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

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

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

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

- **.1** have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- **.2** have sent a Claim to the Surety (at the address described in Section 13).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 16 Definitions

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

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

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

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

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

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

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

§ 18 Modifications to this bond are as follows:

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

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

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

Spring Lake Park City Hall Renovation/Expansion
1301 81st Avenue NE
Spring Lake Park, MN 55432

THE OWNER:
(Name, legal status and address)

City of Spring Lake Park
1301 81st Avenue NE
Spring Lake Park, MN 55432

THE ARCHITECT:
(Name, legal status and address)

Stantec Architecture Inc.
733 Marquette Avenue
Suite 1000
Minneapolis, MN 55402

TABLE OF ARTICLES

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

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

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

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

INDEX
(Topics and numbers in bold are Section headings.)

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

§ 1.8 Building Information Models Use and Reliance

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

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the 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.

DOCUMENT 00 73 05

SUPPLEMENTARY CONDITIONS

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

The terms used in these Supplementary Conditions will have the meanings indicated in the General Conditions.

ARTICLE 3 - CONTRACTOR

A. Add a New Subparagraph 3.2.5 to Paragraph 3.2: The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the Contractor's request for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

B. Add a New Subparagraph 3.4.4 to Paragraph 3.4: The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect to evaluate Contractor's proposed substitutions and to make agree-upon substitutions and to make agreed-upon changes in the Drawings and Specifications made necessary by the Owner's acceptance of such substitutions.

C. Delete Subparagraph 3.7.1 in its entirety and replace with the following Subparagraph 3.7.1: Unless otherwise provided in the Contract Documents, the Contractor shall secure the Building Permit and shall secure and pay for the Electrical Permit, Mechanical 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 tine bids are received or negotiations concluded. The Owner shall waive the fee for the Building Permit. The Contractor shall make arrangements for required inspections. The Contractor shall obtain the Certificate of Occupancy for the Project. The Contractor shall arrange for installation of sewer, electrical, gas, water, and other utilities required, except as otherwise indicated. The Owner shall pay sewer and water access charges (SAC and WAC) and park dedication fees, if any.

D. Regarding 3.10.1, delete the first sentence and insert the following:

"The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a detailed Contractor's construction schedule for the work in form and substance acceptable to the Owner."

ARTICLE 4.2 - ADMINISTRATION OF THE CONTRACT

A. Add a New Clause 4.2.2.1 to Subparagraph 4.2.2: The Contractor shall reimburse the Owner for compensation paid to the Architect for additional Site visits made necessary by the fault, neglect, or request of the Contractor.

ARTICLE 5 - SUBCONTRACTORS

A. Add a New Subparagraph 5.2.5: Acceptance of any supplier or subcontractor shall not mean nor imply acceptance of any material or product not specified in The Contract Documents.

ARTICLE 7 - CHANGES IN THE WORK

A. Add a New Subparagraph 7.1.4: Costs related to a change shall be direct costs. All indirect costs shall be included in the Contractor's overhead and profit. No allowance for overhead and profit shall be allowed if the change results in a net decrease in the Contract Sum. The combined overhead and profit included in the total cost to the Owner of a change in the work shall be based on the following schedule:

1. For the Contractor, for work performed by the Contractor's own forces, 10-percent of the cost.
2. For the Contractor, for work performed by the Contractor's subcontractors, 10-percent of the amount due the subcontractors.
3. For each subcontractor involved, for work performed by that subcontractor's own forces, 10-percent of the cost.
4. For each subcontractor involved, for work performed by the subcontractor's subcontractors, 10-percent of the amount due the sub-subcontractor.
5. Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.6.
6. In order to facilitate checking of quotations for extras or credits, all Bid Forms shall be accompanied by a complete itemization of costs, including labor, materials, and subcontracts. Labor and materials shall be organized and itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also.

B. Regarding 7.3.3, at the end of the introductory sentence, add the following phrase:

"which must be described in the Construction Change Directive."

C. Regarding Paragraph 7.3.6, delete the first sentence and insert the following:

"If the Contractor disagrees in writing within 10 days of the date of the Construction Change Directive with the method for adjustment in the Contract Sum, the method and adjustment shall be determined as a claim."

ARTICLE 9 - PAYMENTS AND COMPLETION

A. Add a New Clause 9.6.2.1 to Subparagraph 9.6.2: Pursuant to Minnesota Statute, Contractor shall be fully responsible to pay subcontractors, suppliers, and other entities within 10 days of the Contractor's receipt of payment for undisputed services provided by the subcontractor, supplier, or other entity. Contractor shall pay interest of 1.5-percent per month or any part of a month to the subcontractor, supplier, or other entity on any amount not paid on time to the subcontractor, supplier, or other entity. The minimum monthly interest penalty payment for an unpaid balance of $100 or more is $10. For an unpaid balance of less than $100, the Contractor shall pay the actual penalty due to the subcontractor, supplier, or other entity. A subcontractor, supplier, or other entity who prevails in a civil action to collect interest penalties from a Contractor must be awarded its costs and disbursements, including attorney's fees, included in bringing the action.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

A. Add a New Clause 10.2.4.1 to Subparagraph 10.2.4: When the use or storage of explosives or other hazardous materials, substances, equipment, or unusual methods are necessary for execution of the work, the Contractor shall give the Owner reasonable advance notice.

B. Regarding Paragraph 10.3.3, delete the last 2 lines and insert the following:

"of property (other than the work itself) and limited to the extent that such damage, loss, or expense is not due to the contributory negligence of a party seeking indemnity."

ARTICLE 11 - INSURANCE AND BONDS

A. Add a new Subparagraph 11.1.2.1:

The limits of liability for the insurance required shall provide coverage for not less than the following amounts or greater where required by law and regulations:

1. *Worker's Compensation Insurance*
   Coverage A - Statutory
   Coverage B - $500,000 Each Accident
   $500,000 Disease - Policy Limit
   $500,000 Disease - Each Employee
2. *Commercial General Liability*
   $3,000,000 General Aggregate
   $3,000,000 Products/Completed Operations Aggregate
   $2,000,000 Each Occurrence
   $2,000,000 Personal Injury
   Products/Completed Operations insurance shall be maintained for a minimum period of at least 1 year after either 90 days following Substantial Completion or Final Payment, whichever is earlier.
3. *Comprehensive Automobile Liability*
   $1,000,000 Combined Single Limit - Bodily injury and property damage. All owned, non-owned, and hired vehicles.
4. *Umbrella Excess Liability*
   $1,000,000 Each Occurrence
   $1,000,000 Aggregate
   Umbrella excess liability shall be a combined single limit which shall provide excess liability insurance over Commercial General Liability, Comprehensive Automobile Liability, and Employers Liability.

B. Add Subparagraph 11.1.2.2:

The following persons or entities shall be included as additional insured on the Commercial Liability, Comprehensive Automobile Liability, and Umbrella Excess Liability. This coverage shall be primary and noncontributory:

OWNER: City of Spring Lake Park

ARCHITECT: Stantec Architecture Inc.

Others_____

C. Add a New Clause 11.1.3.1 to Subparagraph 11.1.3: The Contractor shall furnish 1 copy each of Certificates of Insurance for each copy of the Agreement which shall specifically set forth evidence of all coverages required. The form of Certificate shall be ACORD 25-2, Certificate of Insurance and AIA Document G715, Supplemental Attachment for ACORD 25-2 Certificate of Insurance.

D. In Subparagraph 11.2.1, replace with word "Owner" with the word "Contractor".

E. Delete Subparagraphs 11.2.2 and 11.2.3 in their entirety.

ARTICLE 15 – CLAIMS AND DISPUTES

A. Add the Following to Subparagraph 15.1.6.2: Data substantiating abnormal weather conditions shall include at a minimum local US Weather Bureau Climatological Reports for the period involved plus a report indicating the average precipitation and temperature for the past 10 years from the nearest US Weather Bureau Reporting Station.

END OF DOCUMENT

SECTION 00 82 00

FAIR EMPLOYMENT PRACTICE

PART 1 GENERAL

1.01 SCOPE

A. The City of Spring Lake Park encourages fair employment practice. Discriminatory practices in employment and in labor unions based upon race, color, religious creed, national origin, or ancestry are discouraged. The Contractor and every subcontractor in relation to the subject Contract is encouraged to not discriminate against any employee of or applicant for employment with the Contractor performing work for the City of Spring Lake Park. The words "discriminate" and "discrimination" as used herein are hereby defined and declared to mean and include discriminations or segregation on the ground or because of race, religion, creed, color, national origin, or ancestry.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF DOCUMENT

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SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic description of the Project and Work restrictions.

1.02 SUMMARY OF WORK

A. Project Name: Spring Lake Park City Hall Renovation/Expansion Project for the City of Spring Lake Park, Minnesota.

B. Description of Work: In general, Project Work consists of selective demolition of existing floors, trench drains, walls, doors, and frames, ceilings, mechanical building systems, plumbing building systems, and electrical building systems as indicated in the drawings. New work in the city hall building includes building expansion, new concrete floors and repairs, walls, door and frames, windows, bullet resistant windows and doors, ceilings, mechanical building systems, plumbing building systems, electrical building systems, and new roofing system as indicated on the Drawings and in the Project Manual.

1.03 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:
   1. All Work and costs of this Section shall be incidental to the Project and be included in the Total Base Bid.

1.04 PROJECT MILESTONE AND COMPLETION DATES

A. Substantial Completion: June 13, 2025.

B. Final Completion: June 27, 2025.

1.05 LIQUIDATED DAMAGES

A. Provisions for liquidated damages, if any, are set forth in the Agreement.

1.06 WORK RESTRICTIONS

A. Use of Site:
   1. Contractor shall coordinate with Owner location of construction facilities, staging areas, product stockpiles, material storage, and temporary construction and shall remove upon completion of Work.
   2. Contractor understands this facility will be in operation during construction. Contractor will provide an accurate schedule of work to coordinate with the Owner to ensure facility operation can be maintained.
   3. Contractor responsible for snow removal and disposal from the Owner's property if necessary to maintain access and working space during construction.
   4. Keep existing driveways and entrances clear and available to the public and to the Owner.

5. If additional space is needed, obtain and pay for such space off Site.

B. Access to Site:
   1. Contractor shall coordinate with Owner.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Administrative and procedural requirements for pricing of Work and request for payment procedures.

1.02 ALTERNATES

A. This article identifies each Alternate by number and describes the basic changes to be incorporated into the Work as part of that Alternate. Refer also to the Specifications and Drawings for information.
   1. **Alternate No. 1:** Materials, equipment, and labor necessary to construct Cold Storage 184 as indicated on the Drawings and in the Project Manual.
   2. **Alternate No. 2:** Materials, equipment, and labor necessary to perform work shown in Shooting Range 186 as indicated on the Drawings and in the Project Manual

1.03 LUMP SUM

A. Unless specifically noted as an Alternate or Bid Unit Price Item, all Work shall be included in the Total Base Bid.

B. Total Base Bid shall be based on Base Bid Equipment, Materials, and Labor.

C. Progress payments will be made as Work progresses based on the Schedule of Values established for this portion of the Work.

1.04 SCHEDULE OF VALUES

A. Submit a printed Schedule of Values on AIA Form G703 – Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.

B. Submit Schedule of Values in duplicate within 10 days after date of Owner-Contractor Agreement.

C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the Specification Section. Identify Site mobilization and bonds and insurance.

D. Include in each line item, the amount of allowances specified in this Section. For unit cost allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

E. Revise Schedule of Values to list approved Change Orders with each Application and Certificate for Payment.

1.05 APPLICATIONS FOR PROGRESS PAYMENTS

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

B. Present required information in typewritten form.

C. Form: AIA G702 Application and Certificate for Payment and AIA G703 – Continuation Sheet, including continuation sheets when required.

D. Execute certification by signature of authorized officer.

E. 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.

F. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work:
   1. List Schedule of Values to reflect applicable trade items in CSI format for authorized Change Orders.

G. List each authorized and accepted Alternative as a separate line item, listing Alternative number and dollar amount:
   1. List Schedule of Values to reflect applicable trade items in CSI format for authorized Alternatives.

H. List each allowance as a separate line item, listing allowance number dollar amount:
   1. Whenever possible, list Schedule of Values to reflect applicable trade items in CSI format for allowances.

I. Submit one (1) electronic copy of each Application for Payment in PDF format.

J. Include the following with the application:
   1. Affidavits attesting to off-site stored products.

K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide 1 copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

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 Sections 01 70 00, 01 78 23, 01 78 36, and 01 78 39.
   2. Written Notification of Substantial Completion.
   3. Executed Certificate of Substantial Completion.
   4. Written Notification of Final Completion.
   5. Spare Parts, Operation and Maintenance Manuals, instructions, schedules, warranties, guarantees, bonds, certificates, certificates of inspection, and other documents.
   6. Final Application for Payment, including accompanying documentation.
   7. Remove temporary protection devices and facilities.
   8. Submit final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

9. Submit a copy of the Architect Final Punch-List of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance.
10. Submit Consent of Surety Company to Final Payment (AIA Document G707).
11. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
12. Submit final meter reading for utilities and similar data either as of the Date of Substantial Completion or the date when the Owner took possession of and responsibility for corresponding elements of the work.
13. Submit proof satisfactory to Owner that taxes, fees, and similar obligations of Contractor have been paid (AIA Documents G706 and 706A).
14. Change over door locks and other Contractor's access provisions to Owner's property.
15. Submit lien waivers from Contractor, subcontractors, and material suppliers in the full amount of the Contract.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General requirements for overall Project coordination.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. All Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid.

1.03 UTILITIES

A. Notify Gopher State One Call before starting construction in a given area requesting utility locates in the Site.

B. Project Utility Sources: Coordinate Work with the following utility owners. The following utilities are known to be on the Site and are shown on the Drawings in a general way:
   1. Water: Owner.
   2. Sanitary Sewer: Owner.
   3. Storm Sewer: Owner.
   4. Electric: Xcel Energy.
   5. Traffic Signal: Hennepin County.
   6. Gas: CenterPoint Energy.
   7. Telephone/Cable/Fiber: Comcast, Spring, CenturyLink, Access Communications, Arvig, Rogers Communications, AT&T, Zayo, Others.

C. Owner requires a 48-hour notice for all utility interruptions.

1.04 PERMITS

A. Apply for, obtain, and comply with the provisions of the following permits, which the Owner will waive the permit application fee:
   1. City Building Permit.

B. Apply for, pay all fees, obtain, and comply with all permits, licenses, and approvals which may be required for the Project.

1.05 PROJECT MEETINGS

A. Administrative Requirements:
   1. Project Superintendent or persons designated by the Contractor to attend and participate in the Project meetings shall have all required authority to commit the Contractor to solutions agreed upon in the Project meetings.
   2. Engineer will set the time, sites, and prepare the agenda for the meetings.

3. Engineer will prepare meeting minutes and distribute 1 copy to Contractor. Notify Engineer of inaccuracies or discrepancies in the meeting minutes within 5 calendar days of receipt of the minutes.
4. The attendance and cooperation of subcontractors and suppliers may be required. Contractor shall distribute meeting minutes to subcontractors.

B. Preconstruction Conference:
   1. Architect will schedule a meeting at the Site prior to Contractor occupancy.
   2. Attendance Required: Contractor, Owner, Architect, Contractor's superintendent, and major subcontractors.
   3. Agenda:
      a. Designation of personnel representing the parties in Contract and the Architect.
      b. Procedures and processing of field decision, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
      c. Scheduling.
      d. Use of premises by Owner and Contractor.
      e. Owner's requirements and occupancy prior to completion.
      f. Construction facilities and controls provided by Owner.
      g. Security and housekeeping procedures.
      h. Application for payment procedures.
      i. Procedures for maintaining record documents.
      j. Requirements for start-up of equipment.
      k. Inspection and acceptance of equipment put into service during construction period.
   4. Contractor shall record minutes and distribute copies within 5 days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

C. Progress Meeting Procedures:
   1. Architect will schedule construction progress meetings throughout the duration of the Project to assess the progress of the Work, identify and discuss Project related issues, and discuss near-term construction activities.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:
   1. All Work and costs of this Section shall be incidental to the Project and be included in the Total Base Bid.

1.03 SUBMITTALS

A. Within 10 calendar days after the date of the Agreement, submit preliminary schedule defining planned operations for the first 30 days of Work with a general outline for remainder of work.

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

C. Within 10 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

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

E. Submit updated schedule every 7 days.

1.04 SCHEDULE FORMAT

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

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 CONSTRUCTION SCHEDULE

A. Submit preliminary schedule and progress schedule consistent with the General Conditions.

B. Prepare schedules on 11 inch by 17 inch (maximum size) sheets showing overall sequence of construction. Organize the schedule by work activity. Identify separate stages of each work activity:
   1. List work items in chronological sequence. Show beginning and completion dates of each activity. Include all activities with an estimated duration of 3 days or longer.
   2. Format schedule as a horizontal bar chart. Provide separate bars for each activity or trade.
   3. Provide space for revisions and notations.
   4. Identify interrelations between activities.
   5. Include estimated times for preparation of submittals by Contractor, processing, and review of submittals by Engineer, fabrication, delivery, installation, testing, start-up, instruction of Owner, and clean-up.

C. As Work progresses, revise, update, and resubmit schedule as requested by Engineer. At a minimum, update schedule with each Application for Payment. Show all activities started or finished since previous schedule was submitted and show percentage of completion for each activity.

3.02 DISTRIBUTION OF SCHEDULE

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

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

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General procedures and requirements for submittals during the course of construction.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. All Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid.

1.03 SEQUENCING AND SCHEDULING

A. Schedule submittals consistent with the Contractor's schedule of shop drawings.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 CONSTRUCTION SCHEDULE

A. Submit preliminary schedule and progress schedule consistent with the General Conditions.

B. Prepare schedules on 11 inch by 17 inch sheets showing overall sequence of construction. Organize the schedule by work activity. Identify separate stages of each work activity:
   1. List work items in chronological sequence. Show beginning and completion dates of each activity. Include all activities with an estimated duration of 3 days or longer.
   2. Format schedule as a horizontal bar chart. Provide separate bars for each activity or trade.
   3. Provide space for revisions and notations.
   4. Identify interrelations between activities.
   5. Include estimated times for preparation of submittals by Contractor, processing and review of submittals by Architect, fabrication, delivery, installation, testing, start-up, instruction of Owner, and clean-up.

C. As Work progresses, revise, update, and resubmit schedule as requested by Architect. At a minimum, update schedule with each Application for Payment. Show all activities started or finished since previous schedule was submitted and show percentage of completion for each activity.

3.02 EMERGENCY CONTACT LIST

A. Before any Work at the Site is started, submit a typed list on 8-1/2 inch by 11 inch paper outlining 24 hour on-call contacts for the Project. This list shall include the Contractor's safety representative, key representatives from the Contractor, subcontractors, and suppliers. Include the following information for each contact:
   1. Company name.
   2. Contact person(s).
   3. Local and mobile phone numbers.

3.03 SHOP DRAWINGS AND MANUFACTURERS' INFORMATION

A. Conform to the requirements of the General Conditions, except as modified herein.

B. In addition to requirements in the General Conditions, shop drawings shall contain sufficient specific information to allow Architect to determine compliance with the specifications and standard of quality established therein.

C. The minimum sheet size shall be 8-1/2 inches by 11 inches. Non-legible copies will not be reviewed.

D. Submit one (1) electronic copy of shop drawings in PDF format. Unless specifically required in the Specification Section to include related Specification Sections, each submittal shall contain only one Specification Section. Each submittal shall contain the following information:
   1. Date of submission and date of any previous submittals.
   2. Project Title.
   3. Names Of: Contractor, subcontractor, supplier, and manufacturer.
   4. Specification Section number and identification of product.
   5. Identification of revisions from previous submittals.
   6. A 4 inch by 4 inch blank space for the Architect's stamp.
   7. Resubmittals shall include nomenclature to indicate revision from earlier submittals.

E. Contractor shall reimburse Architect for evaluating more than 2 re-submittals on the same item.

F. Architect's review will be in conformance with the requirements of the General Conditions, except as modified herein.

G. Architect will stamp shop drawings and indicate requirements for Contractor's review or resubmittal as follows:
   1. "**Reviewed**" – Appears that items covered by the submittal will, after installation or incorporation into the Work, conform to the Contract Documents and appears to be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
   2. "**Reviewed as Noted**" – Appears that items covered by the submittal will, after installation or incorporation into the Work, conform to the Contract Documents and appears to be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, except as noted by Architect.

3. "**Revise and Resubmit**" – Appears that items covered by the submittal will not, after installation or incorporation into the Work, conform to the Contract Documents and will not be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Work cannot proceed until the submittal is revised and resubmitted conforming to the resubmittal procedures described in the General Conditions.
4. "**Seal and Signature Required**" – Work covered by the submittal is not complete or it appears that items covered by the submittal have not been signed and/or sealed by a Professional Engineer as required by the Contract Documents. Contractor shall conform to the resubmittal procedures described in the General Conditions.

H. Architect will return reviewed submittals to Contractor via email in electronic PDF format.

3.04 OPERATION AND MAINTENANCE MANUALS

A. Conform to the requirements of Section 01 78 23.

3.05 TEST REPORTS

A. Submit one (1) electronic copy in PDF format of all inspections, tests, and approvals required in the Specifications.

3.06 WARRANTIES

A. Conform to the requirements of Section 01 78 36.

END OF SECTION

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SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Information required for conformance to regulatory requirements.
   2. Quality assurance.
   3. Procedures to measure and report the quality and performance of the Work.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. All Work and costs of this Section shall be incidental to the Project and be included in the Total Base Bid.

1.03 REFERENCE STANDARDS

A. Whenever reference is made to the Minnesota Department of Transportation Specifications, such reference shall mean "Standard Specifications for Construction," 2020 Edition (MnDOT Spec.) and all subsequent revisions and supplements. The word "Engineer" is understood to refer to the Engineer for the Owner.

1.04 SUBMITTALS

A. Prior to start of work, submit testing laboratory name for various specified tests for approval by Engineer.

B. Submit copies of laboratory test results or analysis consistent with Section 01 33 00.

C. Manufacturer's certificates of quality control or performance.

1.05 WORKMANSHIP

A. Comply with industry standards of the region, except where more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

1.06 TESTS AND INSPECTIONS

A. Conform to the requirements of Article 13 of the General Conditions, except as modified herein.

B. Notify Engineer 48 hours prior to expected time for operations requiring tests and inspections.

C. Provide incidental labor and facilities to obtain and handle samples at Site or source, transport samples to laboratory, and facilitate tests and inspections for storing and curing of test samples.

D. Contractor shall pay for required tests as described in Technical Specifications, unless noted otherwise. Contractor shall pay for all costs for re-testing required due to failed tests, including time spent by Engineer to arrange and assist re-testing.

1.07 LABORATORY REPORTS

A. After each inspection and test, submit one (1) electronic copy in PDF format of Laboratory Report to Engineer.

B. Include: Date issued, Project Title and number, name of inspector, date and time of sampling or inspection, identification of product and Specifications Section, location in the Project, type of inspection or test, date of test, results of tests, and conformance with Contract Documents.

1.08 LABORATORY RESPONSIBILITIES

A. Test samples and perform field tests.

B. Provide qualified personnel. Cooperate with Engineer and Contractor in performance of services.

C. Ascertain compliance with the requirements of the Contract Documents.

D. When requested by Engineer, provide interpretation of test results.

1.09 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop Work.

1.10 MANUFACTURER'S CERTIFICATES

A. If requested by Engineer, submit manufacturer's certificate with shop drawings certifying that products meet or exceed specified requirements executed by responsible officer.

1.11 MANUFACTURER'S FIELD SERVICES

A. Provide qualified representative to observe field conditions; conditions of surfaces and installation; quality of workmanship; start-up of equipment; and test, adjust, and balance of equipment.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Arrange for and provide temporary facilities and controls. Pay all costs until final acceptance of the Work.
   2. Make all temporary connections to utilities and services in locations acceptable to the Engineer and local authorities having jurisdiction. Furnish all necessary labor and materials. Maintain connections and remove the temporary installation and connections when no longer required.
   3. Pay costs for temporary electrical power, temporary water, and temporary heating.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. For the purposes of completing the Contractor's Schedule of Values (cost breakdown for payment requests), include no more than 3 percent of the Total Base Bid for the work of this Section.
   2. All other work and costs of this Section shall be incidental to the Project and be included in the Total Base Bid.

1.03 REFERENCES

A. Minnesota Department of Transportation "Standard Specifications for Construction," 2020 Edition (MnDOT Spec.).

B. The Minnesota Manual on Uniform Traffic Control Devices (MMUTCD), including the Field Manual on Temporary Traffic Control Zone Layouts – Latest edition.

1.04 SUBMITTALS

A. If traffic management and control beyond that shown on the Drawings and specified is proposed, submit a Traffic Management and Control Plan consistent with Section 01 33 00. Plan shall include the following information:
   1. Haul and access routes.
   2. Traffic control measures.
   3. Permits or applications required by local authorities.
   4. Temporary facilities required.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 MOBILIZATION

A. Move personnel, equipment, materials, and all other items required to complete the Work at the Site.

B. Establish Contractor's office or other facilities necessary for Work on the Project.

C. Temporarily hold or relocate utilities and any miscellaneous structures, such as signs, power poles, guy wires, and mailboxes disturbed.

3.02 TEMPORARY UTILITIES

A. Provide and maintain all temporary facilities, utilities, and controls as long as needed for the safe and proper completion of the work. Remove all temporary facilities, utilities, and controls as rapidly as progress will permit or as directed by Engineer.

B. Temporary Water for Construction
   1. Contractor may obtain water from Owner at a wall hydrant as directed by the Owner. Owner will pay for water.

C. Temporary Electricity
   1. Contractor may use power from exterior electrical outlets as directed by the Owner. Owner will pay for electricity.

3.03 CONSTRUCTION FACILITIES

A. Sanitary Facilities
   1. Comply with all governing regulations, including safety and health codes, for sanitary fixtures and facilities.
   2. Provide self-contained toilet units, or water and sewer connected temporary toilet facilities consistent with governing regulations. Contractor may not use Owner's toilet facilities.
   3. Provide and maintain adequate supply of toilet tissue, paper towels, paper cups, and similar disposable materials appropriate for each facility. Provide appropriate covered waste containers for used material.

3.04 TRAFFIC CONTROL

A. Provide and maintain all traffic control devices needed to guide, warn, control, and protect traffic throughout the Site. All traffic control devices and other protective measures shall conform to MMUTCD.

B. Remove traffic control devices at the conclusion of the Work.

C. Flaggers are required to protect construction vehicles during unloading of construction materials. Conform to the requirements of the MMUTCD, the Flagging Handbook included in the Field Manual for Temporary Traffic Control Zone Layouts, and the following: while on duty flaggers shall wear hard hats and reflectorized florescent orange vests; and flaggers shall be fully clothed when on duty with shirt or blouse, slacks or trouser, and sturdy shoes.

D. Field Quality Control
   1. Daily inspect and ensure that all traffic control devices required by the construction are in accordance with the MMUTCD. Any discrepancy between the actual devices in use and the required devices shall be immediately rectified.
   2. Furnish names, addresses, and phone numbers of at least 3 individuals responsible for the placement and maintenance of traffic control devices. At least 1 of these individuals shall be "on call" 24 hours per day, 7 days per week during the time any traffic control devices furnished and installed by the Contractor are in place.
   3. Provide access for emergency vehicles at all times.
   4. Respond to any request from the Engineer to improve or correct the usage of traffic control devices on or related to this Project within 1 hour of the time of notification.
   5. Keep all traffic control signs and devices in a legible condition. This shall include but not be limited to removing grime and dust deposited on any device by traffic, natural causes, or when requested by Engineer.

3.05 PEDESTRIAN CONTROL

A. Provide and maintain all pedestrian control devices needed to guide, warn, control and protect pedestrians adjacent to the construction Site.

B. Remove pedestrian control devices at the conclusion of the Work.

3.06 TEMPORARY BARRIERS AND ENCLOSURES

A. Temporary Barriers
   1. Provide temporary covers, enclosures, markers, and barriers as necessary to protect Work.
   2. Damage to the Site caused by removal of temporary fencing, including postholes, shall be promptly repaired by Contractor. During removal at no time shall the work remain unattended if a dangerous condition exists because of incomplete removal or Site repairing.

3.07 CONTRACT DOCUMENTS

A. Keep 1 complete set of Contract Documents, 1 copy of all approved shop drawings, and 1 complete set of up-to-date Record Drawings at the Project Site for use by the Engineer and Owner.

END OF SECTION

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SECTION 01 57 13

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Managing storm water runoff and other Project related water discharges to minimize sediment pollution during construction.

B. Related Sections
   1. Section 31 23 00 – Excavation and Fill.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. All Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid.

1.03 REFERENCES

A. Minnesota Department of Transportation "Standard Specifications for Construction," 2020 Edition (MnDOT Spec.)
   1. 2130 – Application of Water for Dust Control.
   2. 2573 – Storm Water Management.
   3. 2575 – Establishing Turf and Controlling Erosion.

B. MPCA's NPDES General Stormwater Permit for Construction Activity.

1.04 SUBMITTALS

A. Completed application form for the MPCA's NPDES General Stormwater Permit for Construction Activity (MN R100001) conforming to Section 01 31 00.
   1. NPDES permit inspection log resulting from weekly Site inspections.
   2. Amendments to the Stormwater Pollution Prevention Plan (SWPPP) for the Project.
   3. Completed form for MPCA's Notice of Termination.

B. Contractor Prepared Schedules and Plans
   1. Erosion Control Schedule: Conforming to MnDOT Spec. 1717.2C and submitted each week that construction is active.

C. Certification and Sampling
   1. Furnish a manufacturer's certification stating that the material supplied conforms to the requirements of this Section. The certification shall include or have attached typical results of tests for the specified properties, representative of the materials supplied.

1.05 QUALITY ASSURANCE

A. Erosion Control Supervisor: Provide an Erosion Control Supervisor to direct the erosion control operations and ensure compliance with Federal, State, and Local ordinances and regulations.

B. Certified Installers: Provide a certified installer to install or direct installation of erosion or sediment control practices. Certification shall be obtained through the University of Minnesota Erosion Control Inspector/Installer Certification program or approved equal.

1.06 PERMITS

A. Project disturbs 1 or more acres of total land area. Co-submittal with the Owner of a completed NPDES application form for the MPCA's General Stormwater Permit for Construction Activity and the appropriate fees to the MPCA is required. Contractor to Submit Permit application online and Submit a copy of the completed, signed, and dated application form to Owner.

B. Permit coverage will become effective 7 days after the Submittal date of the completed application. Or Permit coverage is anticipated to become effective 30 days after the postmarked date of a completed application form and SWPPP submittal to the MPCA.

1.07 SEQUENCING AND SCHEDULING

A. Install sediment control measures prior to grading activities.

B. Schedule and coordinate the Work so that permanent erosion and sediment control BMPs, such as basin construction, rip rap placement, and permanent seeding, are directly incorporated into the supplement permanent erosion and sediment control BMPs with temporary BMPs. Place temporary BMPs when permanent erosion control cannot be achieved. Coordinate construction operations so that erosion and sediment control measures (permanent or temporary) are installed and maintained concurrently with the rest of the Work of the Project.

C. Coordinate and schedule the Work of subcontractors such that erosion and sediment control measures are fully executed for each operation and in a timely manner over the duration of the Project. Develop a chain of responsibility for all subcontractors and operators on the Project to ensure that permit provisions are adhered to.

D. Infiltration areas and constructed infiltration systems should not be constructed until the contributing drainage area and/or adjacent construction has been completely stabilized. When this timing of construction is not possible, the Contractor shall insure sediment from exposed soil areas of the Project does not enter the infiltration area or system.

E. Stabilization timeframes shall conform to the NPDES General Stormwater Permit for Construction Activity.

F. Prior to Project shutdown for the winter or other periods of a week or more, the Site shall be adequately protected from erosion and off-Site damage by covering exposed soils with mulch and establishing perimeter controls.

PART 2 PRODUCTS

2.01 SILT FENCE: CONFORM TO MNDOT SPEC. 3886.

A. Machine sliced (MS).

2.02 TEMPORARY CONSTRUCTION ENTRANCE

A. Rock Construction Entrance: Conform to the Drawings and the following: 2 inches minimum washed rock.
   2. Underlying Geotextile: Conform to MnDOT Spec. 3733, Type 4.
   3. Minimum Thickness of Rock Placed: 6 inches.

2.03 STORM DRAIN INLET PROTECTION

A. Inlet protection for paved streets with concrete curb and gutter: The following methods are acceptable:
   1. Conform to the details on the Drawings.
   2. Catch Basin Inserts:
      a. Road Drain by Wimco, LLC (www.roaddrain.com).
      b. Lange Industries (www.langeindustries.com), or approved equal.
      c. Filter bag insert conforming to MnDOT Spec. 2573 subject to Site and approved by the Engineer.
   3. Rock Log:
      a. Conform to MnDOT Spec. 3897.2.G.
      b. Rock 3/4 to 1-1/2 inches crushed or natural rounded aggregate.

B. Inlet protection for non-paved surfaces without curb or areas where vegetation will be established. The following methods are acceptable:
   1. Conform to the details on the Drawings.
   2. Silt fence ring, or approved equal:
      a. Place wire mesh cage in a circular or square confirmation to form a minimum 5 foot diameter zone of protection.
      b. Geotextile shall be monofilament/monofilament meeting the requirements of MnDOT Spec. Heavy Duty.
      c. Loose aggregate or a rock log(s) around perimeter of ring to anchor geotextile.
   3. Sediment control inlet hat conforming to MnDOT Spec. 2573:
      a. InfraSafe Sediment Control Barrier by Royal Enterprises (http://www.royalenterprises.net/).
   4. Rock filter as shown on the Drawings.

2.04 SEDIMENT CONTROL LOGS: CONFORM TO MNDOT SPEC. 3897.

A. Straw or wood fiber biorolls, 6 to 7 inches in diameter.

B. Compost or rock logs, 6 to 8 inches in diameter.

2.05 DUST CONTROL

A. Water clear and free from suspended fine sediment.

B. The Owner may elect to have the Contractor apply a chloride solution for dust control.
   1. Calcium Chloride: Conform to MnDOT Spec. 3911.

2. Magnesium Chloride Solution: Conform to MnDOT Spec. 3912.

PART 3 EXECUTION

3.01 GENERAL

A. Comply with all applicable laws, ordinances, regulations, permit requirements, orders and decrees pertaining to erosion/sediment control and stormwater discharge during the conduct of the Work.

B. Take necessary precautions against damage to the Project by action of the elements.

C. Implement the Project's NPDES Stormwater Pollution Prevention Plan (SWPPP) and take necessary actions to prevent off Site damage resulting from Work conducted on the Project or Project related stormwater runoff.

D. Minimize the amount of disturbed land that is susceptible to erosion at any time. Delineate areas not to be disturbed.
   1. Exclude vehicles and construction equipment from area not to be disturbed to preserve natural vegetation.

3.02 INSTALLATION

A. General: Install temporary stormwater management and sediment control devices in conformance with the details, typical sections, and elevations shown on the Drawings.

B. The location of temporary stormwater and sediment control devices may be adjusted from that shown on the Drawings to accommodate actual field conditions and increase the effectiveness of the installation.

C. Silt Fence: Conform to MnDOT Spec. 2573.3.B
   1. Install in the locations shown on the Drawings using the machine sliced installation method, unless directed otherwise by the Engineer.
   2. Use additional measures, such as rock aggregate, placed along the base of the silt fence where the silt fence geotextile cannot be trenched in, i.e. tree roots, frost, bedrock.
   3. Use short sections of silt fence placed in J-hook patterns to
      a. Supplement the perimeter silt fence at corner locations and areas where sediment deposition will occur. No more than 100 feet of silt fence shall be installed per 1/4 acre of drainage.
      b. Break up flow path along silt fence running across contours to be no more than 100 feet between hooks or as directed by the Engineer.
   4. Silt fence longer than 600 feet shall be constructed in separate independent units with each unit having a length less than 600 feet. Avoid splices whenever possible. If necessary, make splices at an opposing fence post and according to the manufacturer's specifications.

D. Temporary Construction Entrance
   1. Install at locations shown on the Drawings.
   2. Construct construction entrance before grading begins on the Site.
   3. Inspect construction entrance daily for mud accumulation to minimize vehicle tracking of sediment onto public roadways. Remove fugitive rock or wood mulch from adjacent roadways daily.

E. Storm Drain Inlet Protection
   1. Provide effective storm drain inlet protection over the life of the Project until all sources with potential for discharging to inlets have been paved or stabilized.
   2. Place devices so that driving hazards or obstructions are not created. The devices must be cleaned out regularly and all devices must have an emergency overflow to reduce flooding potential.

3.03 MAINTENANCE

A. Conform to MnDOT Spec. 2573.3M, NPDES permit, and as follows:
   1. Inspect, maintain, and repair any washouts or accumulations of sediment that occur because of the grading or construction. Restoration consists of grade repair, turf re-establishment, and street sweeping of mud and debris tracked from the Site.
   2. Inspection of all erosion and sediment control items will take place immediately after each runoff event and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
   3. The Contractor shall maintain the temporary sediment control devices until they are no longer necessary and are removed:
      a. Maintenance consists of keeping the devices functioning properly.
      b. The Contractor shall repair or replace plugged, torn, displaced, damaged, or non-functioning devices.
   4. Upon final acceptance of the Project and establishment of permanent erosion control measures, the Contractor shall remove all temporary erosion control measures.

B. Maintenance: Conform to MnDOT Spec. 2573.3.K
   1. If an erosion control device has been reduced in capacity by 30 percent or more, the Contractor shall restore such features to their original condition.

C. Control dust blowing and movement on Site and roads as directed by Engineer to prevent exposure of soil surfaces, to reduce on and off-Site damage, to prevent health hazards, and to improve traffic safety.

END OF SECTION

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SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic requirements for products used in the Work.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. All Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid.

1.03 SUBMITTALS

A. Submit the following items consistent with Instructions to Bidders:
   1. Written request for approval with supporting documentation.

B. Submit the following items consistent with Section 01 33 00 and General Conditions Article 3.12:
   1. Shop drawings for named products and "or-equal" products.
   2. Written application for Substitute Items, including supporting documentation.

1.04 PRODUCT SUBSTITUTIONS AND "OR-EQUAL" PROCEDURES

A. Procedures During Bidding:
   1. Conform to the requirements of the Instructions to Bidders.

B. Procedures During Construction:
   1. Scheduling of Submittals: Conform to the Contractor's Schedule of Submittals.
   2. Submittal Procedures: Conform to the requirements of Section 01 33 00.
   3. Items not approved as "or-equal" may be resubmitted as a Substitute Item.
   4. Engineer will review Substitute Item requests that conform to General Conditions Article 3.4.2 and include, at a minimum, the following additional supporting documentation:
      a. Drawings and Specifications.
      b. Installation lists.
      c. Performance data, including equipment capacity, strengths, weights, and dimensions.
      d. Catalog cut sheets.
      e. Lists of deviations from and exceptions to the Specifications.
      f. Detailed information for all buy-out items, including motors and drives.
      g. Lists of materials of construction.
      h. Maintenance schedules of equipment, including buy-out items.
      i. Other information deemed necessary at the discretion of Engineer.
   5. Incomplete submittals will be returned to Contractor without review.
   6. Contract times will not be modified due to substitute and "or-equal" review process.
   7. Engineer shall not have to prove that an item is not an "or-equal."
   8. Owner does not have to accept proposed Substitute Items.

1.05 SUBSTITUTE ITEMS

A. Procedures During Bidding:
   1. Conform to the requirements of the Instructions to Bidders.

B. Procedures During Construction:
   1. Substitute material or equipment items accepted by the Owner and included in the award of Contract become named materials or equipment.
   2. Submit shop drawings and material certifications consistent with Section 01 33 00.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 DELIVERY

A. Contractor shall inspect all products, equipment, and materials upon arrival at site. Contractor shall note any damage and be responsible for corrective action. Damaged products, equipment, or materials are not acceptable.

B. Transport and handle products in accordance with the manufacturer's instructions. Contractor shall receive all products to be incorporated in the project and shall provide equipment and labor necessary to unload and transport products.

C. Handle and lift products only at designated lift points and by methods to avoid soiling, disfigurement, bending, over stressing, and damage.

D. Store products on shelves, in bins, or in neat groups of like items with seals and labels intact and legible, and in a manner to provide access for maintenance and inspection.

E. Store loose granular materials on clean, solid, flat surfaces, and prevent mixing with foreign matter. Store fabricated products supported above the ground on skids or blocking. Provide surface drainage to prevent erosion and ponding of water.

F. Cover products subject to discoloration or deterioration with impervious sheet covering and protect products from soiling and staining.

G. Store and protect products which are subject to damage by the elements in weathertight, climate-controlled enclosures, and according to the manufacturer's instructions. Maintain temperature, ventilation, and humidity within ranges stated in the manufacturer's instructions.

H. Attach applicable manufacturer's service instructions labeled "STORAGE SERVICE INSTRUCTIONS ENCLOSED" to exterior of each stored product.

I. Inspect, maintain, and service stored products on a regularly scheduled basis, consistent with the manufacturer's instructions.

J. Record inspection, maintenance, services performed, and keep log available for review.

K. Traffic control required for all deliveries to and from the Site(s) shall be the responsibility of the Contractor. All flagmen, barricades, flares, and safety measures are the sole responsibility of the Contractor.

3.02 STORAGE AND HANDLING

A. Protect from damage all materials and equipment to be used in the completed facility.

B. Provide temporary Site security fencing around storage areas and as indicated on the Drawings.

C. The Contractor shall provide the Owner and Engineer with keys or combinations to any locks that may be used to secure fencing gates.

D. Storage areas and hazardous areas shall be protected by use of chain link fence around the perimeter of the area. This fencing is in addition to any other fencing required for Site containment.

3.03 OWNER SUPPLIED PRODUCTS

A. The Contractor shall be responsible for removal, protection, storage, delivery, and installation of all Owner furnished equipment or materials, unless otherwise specified.

B. The Contractor shall be required to make all modifications to structures, equipment, and power to provide a complete and working installation of the Owner furnished products.

C. The Contractor shall provide any materials or equipment required for the installation of the Owner supplied products, including but not limited to electric wire and conduit, pipes, anchors, and supports.

D. The Contractor shall be responsible for inspection of any existing Owner furnished products to verify characteristics prior to Bidding.

E. Install Owner furnished equipment in accordance with manufacturer's recommendations and as specified in other Sections.

F. All costs associated with the complete installation of Owner furnished equipment shall be considered incidental to the Project, unless otherwise specified.

END OF SECTION

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SECTION 01 70 00

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for overall execution of the Work and closeout of the Contract for Final Payment.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. All Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid.

1.03 SUBMITTALS

A. Submit the following items consistent with the Contract and Division 01 Sections:
   1. Record Documents.
   2. Written Notification of Substantial Completion.
   3. Executed Certificate of Substantial Completion.
   4. Written Notification of Final Completion.
   5. Spare Parts, Operation and Maintenance Manuals, instructions, schedules, warranties, guarantees, Bonds, certificates, certificates of inspection, and other documents.
   6. Final Application for Payment, including accompanying documentation.
   7. IC-134 Form.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 EXAMINATION

A. Acceptance of Conditions: By commencing Work, Contractor construes acceptance of the adjacent work as satisfactory to receive subsequent Work.

B. Existing Conditions: Before commencing Work, inspect work completed by others that is adjacent to Work. If adjacent conditions prevent completion of Work, Contractor will not commence Work until the conditions are corrected. By commencing work, Contractor accepts existing conditions.

C. Inspect each product immediately prior to installation. Remove damaged products from Site.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Comply with the manufacturer's instructions for installation of manufactured products to the extent that these instructions are applicable and more explicit or more stringent than requirements indicated in the Contract Documents.

B. Secure Work true to line and level, within recognized industry tolerances, with anchorage devices designed and sized to withstand stresses, vibration, and rocking. Allow for expansion and movement of building.

C. Install each element of work during weather conditions and Project status to ensure coordination of the Work. Isolate each element of Work from incompatible work as necessary to prevent deterioration.

D. Coordinate space requirements and installation of mechanical and electrical work indicated on Drawings. Follow routing shown for pipes, ducts, and conduit; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and repairs.

E. Mount individual units of Work at industry recognized standard-mounting heights for the particular application indicated, where mounting heights are not indicated.

F. Conceal pipes, ducts, and wiring within the construction in finished areas, except as otherwise indicated. Coordinate locations of fixtures and outlets with finish elements.

G. Record installation details and prepare Record Documents consistent with the General Conditions.

3.03 EQUIPMENT VARIATIONS

A. Contractors are advised that because of manufacturer's variations in equipment design changes from Drawings in piping arrangement and layout, electrical and control circuitry, and related dimensions of equipment foundation and anchorage details may be required for equipment installations.

B. Equipment requiring minor deviations in the system layout, such as minor piping revisions, will be acceptable; however, the Contractor shall include all costs associated with the deviation in their Bid. Should the deviation require revisions in the design of the facility, the Contractor shall reimburse the Owner for the cost of any redesign.

C. Electrical and mechanical piping, conduits, and ducts are shown schematically and shall be located by the Contractor to avoid any conflicts. Contractor shall coordinate work of all subcontractors and make minor relocations as necessary at no change to the Contract Price.

3.04 SITE MAINTENANCE

A. Maintain stockpiles, excavations, access roads, and all other work areas free from dust. Employ dust abatement techniques whenever a dust nuisance or hazard occurs, or as directed by Architect. Comply with local ordinances.

B. Protect hazardous work areas and hazardous material storage areas.

C. Protect trees, unless specifically indicated on Drawings to be removed.

D. Clean access roads and haul routes with mechanical street sweeper.

E. If Contractor fails to maintain Site, Architect will provide Written Notice of Contractor's defective Work. Contractor will be given 12-hours from the Notice to clean Site. After the 12-hour period, Owner may correct the defective Work consistent with Article 13.09 of the Conditions of the Contract.

3.05 CLEANING AND PROTECTION

A. Clean and protect Work in progress and adjoining Work during handling and installation. Apply protective covering on installed Work where it is required to ensure freedom from damage or deterioration.

B. Clean and perform maintenance as frequently as necessary throughout construction period. Adjust and lubricate operable components to ensure operability without damage effects.

3.06 FINAL CLEANING

A. Wash and polish all glass surfaces.

B. Dust, vacuum, wash, and clean all spaces, duct work, light fixtures, equipment, electrical work, and all other components of the Work. Remove all stains, dust, and dirt.

C. Wash, clean, and sterilize plumbing fixtures.

D. Replace burned out lamps. Replace all HVAC filters.

3.07 CUTTING AND PATCHING

A. Complete all cutting, fitting, and patching as necessary to join the new Work to existing conditions.

B. Remove or cut existing work only as necessary to join the new Work to the existing construction or as required by the Contract Documents.

C. Patch defective and incomplete surfaces caused or exposed by Work of the Project.

D. Repair any damage to existing conditions and patch to match.

E. Existing construction designated by the Contract Documents to remain that is loosened, cracked, or otherwise damaged or defaced beyond repair as a result of Work by the Contractor will be considered unsuitable for the use intended and shall be removed and replaced by the Contractor.

3.08 SPECIAL TOOLS

A. Provide any special tools, jigs, fixtures, and lifting tackle which are necessary for assembly, erection, operation, maintenance, and repair of equipment.

B. Special tools and devices are those the design, purpose, and use of which are peculiar to the equipment furnished and which are not available from normal wholesale or retail outlets. Standard general-purpose tools are not included in this requirement.

C. Provide neat and substantial metal toolbox with hinged cover and lifting handles or metal cabinet with hinged door.

3.09 SPARE PARTS

A. Required spare parts are listed under the individual Specification Sections.

B. Deliver spare parts to Owner in original manufacturer's wrapping or container at substantial completion.

C. Contractor and Owner shall inspect spare parts and sign a document verifying transfer of spare parts to Owner.

3.10 CERTIFICATE OF COMPLIANCE WITH MINNESOTA STATUTES 290.92 AND 290.97

A. Upon completion of the Project and prior to Final Payment, the Contractor and all subcontractors shall complete Minnesota Department of Revenue Revised Form IC-134. This form, Affidavit for Obtaining Final Settlement of Contract with the State of Minnesota and any of its Political or Governmental Subdivisions, is to be signed by a Department of Revenue representative and forwarded to the Owner. Copies of this form can be obtained by writing to the Minnesota Department of Revenue, 600 North Robert Street, St. Paul, MN 55101 or by calling (651) 282-9999 or 1 (800) 657-3594. They are also available on their website: www.revenue.state.mn.us, or via email at withholding.tax@state.mn.us.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General procedures and requirements for Operation and Maintenance Manuals.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. All Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid.

1.03 SEQUENCING AND SCHEDULING

A. Schedule submittals consistent with Contractor's schedule of submittals.

B. Operation and Maintenance Manuals must be approved before placing equipment into operation.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 SUBMITTAL PROCEDURES

A. Submit one (1) preliminary electronic copy of the Operation and Maintenance Manuals 30 days prior to equipment startup for review by the Architect. Architect will review and return one set to the Contractor marked "Reviewed," "Reviewed as Noted," "Revise and Resubmit," or "Seal and Signature Required" consistent with Section 01 33 00.

B. Electronic copy shall be in Adobe Acrobat format. Electronic copy shall include bookmarks.

C. After the Operation and Maintenance Manuals have been corrected, submit 3 final paper copies and 1 final electronic copy.

D. Manuals shall include detailed equipment drawings and explicit instructions on the operation and maintenance of each piece of equipment furnished on the Project.

E. Operation and Maintenance Manuals shall be submitted separately from shop drawings.

3.02 OPERATION AND MAINTENANCE MANUALS

A. Manuals are required for all equipment, accessories, devices, etc. that require adjustment, maintenance, operation, or repairs by the Owner's personnel, including driver, motors, controls, etc. All information shall be supplied by the appropriate equipment manufacturers, neatly bound in rigid cover ring type binders by the Contractor, and properly indexed. Manuals shall include record shop drawings and copies of factory certified tests. Each manual shall contain the following information where applicable:
   1. Operation and Maintenance Manuals shall be clearly identified as operation and maintenance submittal.
   2. All performance and design characteristics and unit identification, such as model and serial numbers.
   3. All accessories or options furnished with unit.
   4. Complete instruction on lubrication, testing, balancing, etc.
   5. List of recommended lubricants.
   6. Step-by-step instructions for repair or overhaul.
   7. Parts list and parts diagram.
   8. Long-term and short-term storage and shut-down procedures.
   9. Trouble-shooting instructions.
   10. Assembly and disassembly instructions.
   11. Wiring diagrams.
   12. Copy of approved/revised shop drawings.
   13. Listing of spare parts the Owner should keep on hand as recommended by the manufacturer.
   14. Name and phone number of supplier and manufacturer where repair parts or additional information can be obtained.
   15. Copy of warranty.

B. Each manual shall be specifically for the items actually installed. Where manuals show a number of models or options, the manual shall be clearly marked to indicate what was furnished and which instructions apply to the furnished unit.

C. Superfluous information pertaining to other models, options, etc. not furnished shall be clearly crossed out or otherwise eliminated. Failure to meet this Section of the Specifications will result in payment reduction.

D. Manuals shall also contain any technical bulletins, memos, and like documents referenced by the manufacturer's manual.

E. Manuals shall also contain additional data deemed necessary by the Architect to provide Owner with complete operational and maintenance data for the product or equipment provided as part of the Work.

END OF SECTION

SECTION 01 78 36

WARRANTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Warranties for the Work of this Project.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. All Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid.

1.03 SUBMITTALS

A. Bind in commercial quality, 8-1/2 inch by 11 inch, 3-ring, side binders with hardback, cleanable, plastic covers.

B. Table of Contents: Provide neatly typed, Table of Contents matching that of the Project Specifications with each item identified with the number and title of the Specification Section in which specified and the name of the product or work item.

C. Label cover of each binder with typed or printed title WARRANTIES with title of Project; name, address, and telephone number of Contractor and equipment supplier; and name of responsible principal.

D. Separate each warranty 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 principals.

1.04 PREPARATION OF WARRANTIES

A. Obtain warranties executed in duplicate by responsible subcontractors and suppliers within 10 days of completion of the application item or Work. Leave date of beginning of time of warranty blank until the 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 until delivery time indicated below.

1.05 DELIVERY

A. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.

B. Within 10 days after Architect's declared and written confirmation of the Date of Substantial Completion.

C. For items of Work when 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.

1.06 LENGTH OF WARRANTY

A. Minimum length of all equipment warranties shall extend through the Correction Period.

B. Length of Warranties: Conform to the requirements of the Specifications.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. General procedures and requirements for Project record documents.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. All Work and costs of this Section shall be incidental to the Project and be included in the Total Base Bid.

1.03 SUBMITTALS

A. At completion of Project, deliver Project Record Documents to the Architect prior to request for Final Payment.

B. Accompany submittal with transmittal letter, in duplicate, containing:
   1. Date.
   2. Project Title and Project number.
   3. Contractor's name and address.
   4. Title and number of each record document.
   5. Certification that each document as submitted is complete and accurate.
   6. Signature of Contractor or his authorized representative.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain at the Site 1 copy of:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. RFI's (Requests for Information) and RFI Responses.
   5. Proposal Requests.
   6. Change Orders.
   7. Reviewed Shop Drawings, Product Data, and Samples.
   8. Field Test Records.
   9. Other Modifications to the Contract.

B. Store documents separate from documents used for construction.

C. Maintain documents in clean, dry, legible condition.

D. Do not use record documents for construction purposes.

E. Ensure entries are complete and accurate, enabling future use by Owner.

F. Record information concurrent with construction progress. Failure to maintain documents up-to-date will be cause for withholding payments.

G. Make documents available for inspection by Architect and Owner.

H. Record Drawings and Shop Drawings
   1. Required information may, as an option, be entered on a "working set" and then at completion of Project transfer the information to a final submitted "Project Record" set.
   2. Legibly mark to record actual construction:
      a. Depths of various elements of foundation in relation to finished first floor datum.
      b. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
      c. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
      d. Field changes of dimension and detail.
      e. Changes made by Change Order or Field Order.
      f. Details not on original Contract Drawings.

I. Specifications and Addenda
   1. Legibly mark up each Section to record:
      a. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
      b. Product substitutions or alternates utilized.
      c. Changes made by Change Order or Field Order.
      d. Other items not originally specified.

END OF SECTION

SECTION 02 41 13

SELECTIVE SITE DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Complete or partial removal and disposal or salvage of at grade, above grade, and below grade structures and miscellaneous items.

B. Related Sections
   1. Section 31 23 00 – Excavation and Fill.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. All Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid.

1.03 REFERENCES

A. Minnesota Department of Transportation "Standard Specifications for Construction," 2020 Edition (MnDOT Spec.)
   1. 2104 – Removing Pavement and Miscellaneous Structures.

1.04 DEFINITIONS

A. Remove: To take away or eliminate from the Site by any method selected by the Contractor, including disposal of material.

B. Salvage: To dismantle, disassemble, or remove carefully without damage so the item can be re-assembled, replaced, or reused in a workable condition equal to that existing before removal.

C. Abandon: To fill, bulkhead, or close off pipes and structures so that no settlement or flow can occur.

1.05 REGULATORY REQUIREMENTS

A. Conform to MnDOT Spec. 2104.3, with the following modifications:
   1. Dispose of all materials designated for removal outside the Site at locations selected by Contractor.
   2. Stockpile or temporarily store materials designated for salvage at locations provided by Contractor.

1.06 SCHEDULING

A. Prior to starting Work, submit for review by the Engineer and approval by the Owner, a schedule showing the commencement, order, and completion dates of the various parts of this Work.

B. Fill holes or depressions resulting from removal or salvage immediately.

C. Provide temporary surface restoration for traffic continuity where removal or salvage operations are completed within streets, driveways, or parking lots.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.01 GENERAL

A. Dispose of all items removed, except for those items identified to be salvaged or recycled. Said disposal shall be in accordance with all laws, regulations, statutes, etc.

B. Perform removal work without damage to adjacent retained work. Where such Work is damaged, the Contractor shall patch, repair, or otherwise restore same to its original condition at no expense to the Owner.

C. Remove debris from the work area as often as necessary, but not less than at least once at the end of each workday. Debris shall be placed in approved containers to prevent the spread of dust and dirt.

D. Execute the Work in a careful and orderly manner with the least possible disturbance to the public and occupants of buildings.

E. Fill holes resulting from removals consistent with Section 31 23 00.

3.02 EXAMINATION

A. Meet with owners of signs to determine requirements for salvage, storage, and replacement.

B. Develop plan acceptable to Engineer and postal service for maintaining mail service.

3.03 PROTECTION

A. Take all necessary precautions to adequately protect personnel and public and private property in the areas of Work. All Site fencing shall be in place prior to the start of any removal work.

B. All street signs, traffic control signs, guy wires, mailboxes, posts, wood fence, etc. which may interfere with construction shall be removed, stored safely, and replaced.

C. Approved barriers or warning signs shall be provided as necessary.

D. Provide and maintain temporary protection of existing structures designated to remain where removal work is being done, connections made, materials handled, or equipment moved.

E. Do not close or obstruct walkways or roadways. Do not store or place materials in passageways or other means of egress. Conduct operations with minimum traffic interference.

F. Take reasonable precautions to limit damage to existing turf.

G. Holes or depressions created by removals shall not be left open for more than 1 day. Any hole within 10 feet of sidewalks shall be filled, suitably marked, or covered immediately.

H. Avoid disturbance to any material beyond the limits required for new construction.

3.04 SAWING PAVEMENT

A. Concrete Pavement: Saw along the removal line to a depth of 1/3 of the thickness of the concrete prior to breaking off the pavement.

B. Bituminous Pavement: Saw along the removal line to a minimum depth of 3 inches prior to breaking off the pavement.

3.05 REMOVE BITUMINOUS PAVEMENT

A. Remove in accordance with MnDOT Spec. 2104.3.C.2, except as modified below:
   1. Saw cut bituminous pavement at the removal limits prior to that removal, unless otherwise approved by the Engineer.
   2. Prior to restoring trench areas, the edges of the trench shall be trimmed back to a vertical face on a straight line which is parallel with the centerline of the trench.

3.06 REMOVE CURB AND GUTTER

A. Saw cut at removal limits.

B. Concrete Curb and Concrete Curb and Gutter: Do not disturb any material beyond the limits required to form for new construction (assumed 12 inches maximum from the back of new work and 6 inches beyond the edge of new driveways).

3.07 REMOVE MANHOLES AND CATCHBASINS

A. Remove structure in its entirety.

3.08 REMOVE SECTIONS OF EXISTING PIPE

A. Pipes to be abandoned shall be bulkheaded with non-shrink concrete grout 8 inches thick at the upstream ends, at the downstream ends that connect to catch basins, manholes, and at locations as determined by the Engineer.

B. Precast concrete plugs may be used in lieu of bulkhead. Plug must fit snugly into pipe opening and be watertight.

C. Pipe to be abandoned shall be filled with suitable material as directed by the Engineer.

D. Pipe to be abandoned shall be removed if the top of pipe is within 3 feet of final surface elevation.

3.09 FIELD QUALITY CONTROL

A. Salvaged items to be reinstalled shall be of the same shape, dimension, location, and quality of the original item prior to construction.

B. Items damaged during removal or salvaging operations shall be replaced with new material of equal type and quality of the damaged item when it was new.

3.10 DISPOSING OF MATERIAL

A. Conform to MnDOT Spec. 2104.3.D.

B. Dispose of all materials outside of the Site at disposal location selected by Contractor in compliance with state and local regulations. Burying of material and debris is not allowed within the Site.

END OF SECTION

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. SECTION INCLUDES
1. Removal of existing concrete floor slab, trench drains, and associated underfloor plumbing systems as indicated on the drawings.
2. Removal of existing exterior walls, windows, doors, and frames as indicated on the drawings.
3. Removal of existing interior walls, doors and frames, ceilings, mechanical building systems, and electrical building systems as indicated on the drawings.
4. Removal of existing plumbing fixtures and associated plumbing systems above and below the floor as indicated on the drawings.

1.02 MEASUREMENT AND PAYMENT

A. This Work shall include the removal of all items encountered during construction, whether in view or hidden underneath the surface of the roofing system, regardless of whether shown on the Drawings.

B. All other Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid, unless noted otherwise.

1.03 SUBMITTALS

A. Shop Drawings: Indicate demolition and removal sequence; location and construction of barricades, fences, and temporary work.

1.04 PROJECT RECORD DOCUMENTS

A. Accurately record locations of capped utilities and subsurface obstructions on the Contractor's record drawing set.

1.05 REGULATORY REQUIREMENTS

A. Except as modified by governing codes and by this Specification, comply with the applicable provisions and recommendations of ANSI A-10.2, Safety Code for Building Construction and OSHA.

B. Conform to applicable code for demolition of structure, safety of adjacent structures, and dust control.

C. Obtain required permits from authorities.

D. Notify affected utility companies before starting Work and comply with their requirements.

E. Do not close or obstruct roadways, sidewalks, or hydrants without permits.

F. Conform to procedures applicable when discovering hazardous or contaminated materials.

1.06 SCHEDULING

A. Before commencing any alteration or demolition work, submit for review and approval of the Owner, a schedule showing the commencement, the order, and the Completion Dates for the various parts of this Work.

B. Before starting any Work relating to existing utilities that will be temporarily discontinue or disrupt service to or within the existing building, notify the Owner 72 hours in advance and obtain the Owner's approval before proceeding with this phase of the Work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Products required to complete the Work, including protective coverings, platforms, barriers lights, water and other items required by this Section.

PART 3 EXECUTION

3.01 PROTECTION

A. Provide, erect, and maintain barriers and security devices.

B. Protect existing nearby trees and landscaping materials, appurtenances, and structures which are not to be demolished.

C. Prevent movement or settlement of nearby structures which are not to be demolished.

D. Mark location of utilities.

E. Make such explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent any damage to existing building.

F. Provide, erect, and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items as required for proper protection of the workmen engaged in demolition operations, public, and adjacent construction.

G. Provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.

H. Provide and maintain temporary protection of the existing structure designated to remain where demolition, removal, and new Work is being done, connections made, materials handled, or equipment moved.

I. Take necessary precautions to prevent dust and dirt from rising by wetting demolished masonry, concrete, plaster, and similar debris. Protect unaltered portions of the existing building affected by the operations under this Section by dust proof partitions and other adequate means.

J. Provide adequate fire protection in accordance with local Fire Department requirements.

K. Do not close or obstruct walkways without the authorization of the Engineer. Do not store or place materials in means of egress. Conduct operations with minimum traffic interference.

L. Assume responsibility for any damage to the existing structure or its contents resulting from the insufficient protection.

3.02 GENERAL REQUIREMENTS

A. Conduct demolition, removal, and alteration work to minimize interference with nearby structures. Cease operations immediately if nearby structures appear to be in danger and notify Owner. Do not resume operations until directed.

B. Conduct operations with minimum interference to public or private accesses. Maintain protected egress and access at all times.

C. Conduct operations with minimum traffic interference.

D. Do not traverse or infringe upon adjacent properties.

E. Owner shall have the right to keep any removed/salvaged items. Contractor shall review with Owner prior to construction and on an on-going basis through construction. Contractor shall transfer salvaged items to the Owner.

F. Materials or items demolished not desired to be kept by the Owner or designated to be reinstalled shall become the property of the Contractor and shall be removed from the Owner's property. All costs for removal, handling, transportation, and disposal shall be included in the Bid.

G. Remove materials or items desired to be kept by the Owner with care and store in a location at the Site to be designated by the Owner.

H. Materials or items designated to be reinstalled shall be as shown on the Drawings. Remove such items with care under the supervision of the trade responsible for reinstallation; protect and store until required. Replace material or items damaged in its removal with similar new material.

I. Where alterations occur or new and old work join, cut, remove, patch, repair, or refinish the adjacent surfaces or so much thereof as is required by the involved conditions, and leave in as good a condition as existed prior to the commencing of the work. The materials and workmanship employed in the alterations, unless otherwise shown or specified, shall conform to that of the original work. Alteration work shall be performed by the various respective trades that normally perform the particular items of Work.

J. Finish new and adjacent existing surfaces to match existing adjacent surfaces. Clean existing surfaces of dirt, grease, loose paint, and so on before refinishing.

K. Where existing equipment and/or fixtures are indicated to be reused, repair such equipment and/or fixtures and refinish to put in perfect working order. Refinish as directed.

L. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.

M. Confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the new Work. Cut and fold back existing fully adhered membrane roofing. Cut and remove insulation, and so on. Provide temporary weather tight protection as required until new roofing and flashings are installed.

3.03 WORKMANSHIP

A. Perform such Work required with due care, including shoring, bracing, and so on. Be responsible for any damage that may be caused by such Work to any part or parts of existing structures or items designated for reuse. Perform patching, restoration, and new work in accordance with applicable Technical Sections of the Specifications.

B. Disconnect and remove/cap utilities within demolition and proposed work areas.

C. Remove demolished materials from Site and dispose of in compliance with all regulatory requirements, including any contaminated, vermin-infested, or dangerous materials encountered.

D. Do not burn or bury materials on Site.

E. Provide, erect, and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items as required for proper protection of the workmen engaged in demolition operations, public, and adjacent construction.

F. Perform such work required with due care, including shoring, bracing, and so on.

3.04 PROTECTION OF REMAINING EQUIPMENT AND STRUCTURES

A. The Contractor shall use great care in the removal of equipment and structures to ensure that existing equipment and structures remaining will not be damaged.

B. Dust-proof partitions or other adequate means shall be erected and maintained as required to prevent dust, fumes, and smoke from spreading to other parts of the building.

3.05 PAINTING

A. Patch and paint all holes left by demolition or removal. Paint and texture to match existing.

3.06 CLEAN UP

A. Remove debris as the Work progresses and maintain the premises in a neat and clean condition.

B. All demolition debris shall be either immediately removed from the Site or placed in approved Contractor furnished containers and removed from the Site when container is filled. Debris shall be delivered to an approved landfill.

C. Remove temporary Work.

D. Upon Project completion, Contractor shall be responsible for all labor and material costs associated with the cleaning of the existing building. All equipment, walls, ceilings, rafters, joists, windows, etc. shall be left in the same condition as they were before the Project started. Filters for mechanical equipment shall be replaced upon Project completion.

E. Leave Site in clean condition.

END OF SECTION

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SECTION 03 45 00

ARCHITECTURAL PRECAST WALL PANELS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Insulated panels.
   2. Accessories.

B. Related Sections
   1. 03 30 00 – Cast-in-Place Concrete.
   2. 04 22 00 – Concrete Unit Masonry.
   3. 05 21 00 – Steel Joist Framing.
   4. 05 31 00 – Steel Decking.
   5. 05 50 00 – Metal Fabrications.
   6. 07 62 00 – Sheet Metal Flashing and Trim.
   7. 07 92 00 – Joint Sealants.
   8. 08 11 00 – Metal Doors and Frames.
   9. 08 36 13 – Upward Acting Sectional Doors.

1.02 REFERENCE STANDARDS

A. Reference the "Latest Edition" of all Standards unless noted otherwise.

B. ACI – American Concrete Institute International.

C. ACI 318 – Building Code Requirements for Structural Concrete.

D. American Society for Testing Materials (ASTM)
   1. A36 – Standard Specification for Carbon Structural Steel.
   2. A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   3. A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   4. A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
   5. A416 – Standard Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete.
   6. A497 – Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
   7. A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   8. A616 – Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement.
   9. A617 – Standard Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement.
   10. A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   11. A706 – Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

12. C150 – Standard Specification for Portland Cement.
13. C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

E. AWS – American Welding Society.

F. ICC (IBC) – 2018 International Building Code.

G. PCI – Precast/Prestressed Concrete Institute
1. PCI MNL-116 – Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.
2. PCI MNL-117 – Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.
3. PCI MNL-120 – PCI Design Handbook – Precast and Prestressed Concrete.
4. PCI MNL-135 – Tolerance Manual for Precast and Prestressed Concrete Construction.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate openings sizes and locations, attachment of related items, and other work related to the fabrication and installation of precast concrete units including the following:
1. Cast-in Electrical Devices: Cast-in Electrical Devices: Coordinate the location of cast-in electrical conduit and junction boxes. Provide panel layout drawings and elevations to Electrical Contractor a minimum of one week prior to casting. Notify Electrical Contractor a minimum of 48 hours prior to casting so they can travel to site and provide and install electrical items in casting forms.
2. Mechanical and Plumbing Penetrations.

B. Sequencing: Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

C. Preinstallation Meeting: Conduct a preinstallation meeting a minimum of two weeks prior to installation of precast concrete. Require attendance of related trades and the Architect. Review the following items:
1. Review shop drawings and installation details.
2. Anchor and weld plate locations.
3. Opening locations including those cut in the field.
4. Limitations on field cutting and core drilling.
5. Site access requirements and obstructions including but not limited:
a. Access roads and maintenance thereof.
b. Protection and repair of existing paving.
c. Dewatering of footing trenches.
d. Job site snow removal.
e. Job site debris removal.
f. Overhead obstructions including power lines.
6. Cold weather grouting requirements and expectations.
7. Cleaning responsibilities and expectations.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide precast concrete units and connections capable of withstanding design loads within limits and under conditions indicated on Drawings.

1. Loading Requirements: As indicated on the drawings.
2. Fire Resistance Ratings per 2020 Minnesota State Building Code: As indicated on the drawings.

1.05 SUBMITTALS

A. See Section 01 33 00 – Submittal Procedures.

B. Shop Drawings: Include layout plans with unit locations, bearing and top of unit elevations, overall dimensions, building cross sections, wall sections, details, and opening locations.
   1. Separately elevate and dimension each type of unit. Indicate location of each unit on overall layout by using the same identification mark placed on the actual unit.
   2. Detail head/jamb/sill for each type of cast-in window and door opening including blocking and finish intentions.
   3. Indicate all cast-in openings 12 inches or larger in dimension. Label each opening as "cast-in". Generally, note all other non-cast-in openings are to be cut in the field by related trades after approval by Precaster's engineer.
   4. Indicate welded connections by AWS standard symbols and show size, length, and type of each weld.
   5. Indicate locations of and detail hardware and anchorage devices to be cast-in to precast units with relationship to structure.
   6. Indicate locations of and detail hardware and anchorage devices to be embedded into or attached to structure or other construction with relationship to structure.
   7. Schedule loose hardware and anchorage devices to be installed by others; Include in schedule: identification marks, item descriptions, and total quantities.
   8. Indicate locations of and detail lifting and handling devices. Use side or edge devices at all locations to minimize unsightly patching at exposed faces. Any face locations must be preapproved by the Architect.
   9. Indicate sections and details showing quantities and position of reinforcing steel and related items including special reinforcement.
   10. Indicate locations of and detail solid concrete and reduced insulation zones. These types of zones are unacceptable unless absolutely necessary and must be preapproved by Owner and Architect prior to fabrication.
   11. Indicate shim sizes and grouting sequence.
   12. Provide handling procedures, sequence of erection, and bracing plan.

C. Comprehensive Engineering: Signed and sealed by a professional engineer responsible for its preparation who is registered in the state in which the project is located. Include all dead, live, and other applicable loads used in the design. Indicate loading on shop drawings.

D. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, notify the Architect immediately and submit design calculations and drawings. Do not adversely affect the appearance, durability or strength of units when modifying details or materials. Maintain the general design concept when altering size of units and alignment.

E. Samples: Provide Owner/Architect with samples representing the range of finishes and textures when requested. Samples to be a minimum of 12 by 12 by 2 inches in size. Owner/Architect to verify finishes meets or exceeds the expectation of the design intent. Samples are not intended to replace mock-up panels.

F. Test Reports: At the request of the Owner/Architect provide test reports for concrete and other structural materials tested during fabrication including cement mill reports, mix reports, cylinder break reports.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Precast concrete to be designed under the direct supervision of a Professional Structural Engineer licensed in the state where the project resides and be directly employed by precast fabricator to assure that quality and structural integrity is being scrutinized on a daily basis.

B. Fabricator Qualifications: A firm that specializes in manufacturing the types of precast concrete specified in good standing in the PCI Plant Certification Program, and that complies with the following requirements: No Exceptions. No other plant certification will be accepted.
   1. Assumes responsibility for engineering precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and Comprehensive Engineering analysis by a qualified Professional Engineer.
   2. Participates in PCI's Plant Certification program at the time of bidding and through the construction process.
   3. Has sufficient production capacity to produce required units without delaying the Work.
   4. Is registered with and approved by authorities having jurisdiction.

C. Erector Qualifications: PCI Certified, approved by the precast concrete manufacturer, and having a minimum of 5 years' experience in the erection of precast concrete similar to the requirements of this project. Erector's workman shall be properly trained to handle and erect precast units.

D. Design Standards: Comply with ACI 318 (ACI 318M) and the design recommendations of PCI MNL 120, "PCI Design Handbook – Precast and Prestressed Concrete," applicable to types of structural precast concrete units indicated.

E. Quality-Control Standard: For manufacturing procedures and testing requirements and quality control recommendations for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Concrete Products."
   1. Comply with camber and dimensional tolerances of PCI MNL 135, "Tolerance Manual for Precast and Prestressed Concrete Construction."

F. Welder Qualifications: AWS Certified, approved by the precast concrete manufacturer, and having a minimum of 5 years' experience in the erection of precast concrete similar to the requirements of this project. Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel"; and AWS D1.4, "Structural Welding Code – Reinforcing Steel."

G. Pollution Control Regulations: Comply with all pollution control regulations in fabricating and finishing of all products. Protection of air and ground water is the utmost importance.

H. Capture all water runoff and filter air as necessary in the fabrication process in compliance with all state and federal pollution control agencies.

1.07 DELIVERY, STORAGE, AND HANDLING

A. General Requirement: All lifting and handling, transportation and delivery, storage and support, and erection of precast panels to be performed by qualified personnel using methods and equipment approved by manufacturer.

B. Identification: Label each unit with date of production and mark indicating unit location on the shop drawings.

C. Lifting and Handling: Lift and handle units at all times by lifting points indicated on the shop drawings. Lift with manufacturer approved lifting devices. Lifting devices to have a minimum safety factor of 5 to 1.

D. Transportation and Delivery: Transport units in accordance with manufacturer requirements.

E. Storage and Support: At all times store and support units off ground with identification marks clearly visible and so lifting devices are accessible and undamaged. Separate stacked units by batten across full width of each bearing point. Do not use stacked precast units for storage of other units or equipment.

1.08 FIELD CONDITIONS

A. Contractor shall prepare and maintain site free of obstructions as required by precast erector for the work of this section.

B. Cold Weather Grouting: Provide written procedures to address cold weather grouting to Owner/Architect prior to the erection process.

1.09 WARRANTY

A. Warranty in accordance with Section 01 78 36.

B. Provide twelve-month guarantee for workmanship, materials, and satisfactory performance from date of Substantial Completion.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Precast Concrete:
   1. Wells Concrete Products: www.wellsconcrete.com.
   2. Substitutions: See Section 01 60 00; including the following requirements:
      a. Manufacturer and plant must be PCI Certified. No Exceptions.
      b. Manufacturer must submit product information including typical details, proposed product construction, handling information, solid concrete zone locations, reduced insulation zones, etc. for approval by Architect.
      c. Manufacturer must obtain written approval from Project Architect prior to submitting bid.

d. Prequalified Precaster must have in-house engineering capabilities. No others permitted without being prequalified.
e. Precast Erector shall be PCI Certified.

2.02 PRECAST UNITS

A. Insulated Wall Panels:
1. Size/Shape/Profile: As indicated on the drawings.
2. Panel Width: 10'-0" unless noted otherwise.
3. Overall Thickness: 14-inch thick, unless noted otherwise; 3 inch exterior wythe; 3 inch insulation; and 8 inch interior wythe, unless noted otherwise. Thickness may change per design requirements.
4. Form Side Architectural Finish: As indicated/scheduled on the drawings, refer to finish description types below.
5. Form Side Architectural Color: As indicated/scheduled on the drawings.
6. Form Side Non-Architectural Finish: Grade B (PCI), refer to description below.
7. Form Side Non-Architectural Color: Gray.
8. Screed Side Finish: Standard Float (Warehouse Grade), refer to description below.
9. Screed Side Color: Gray.

B. Form Side "Architectural Finish Type" Descriptions:
1. Cast on Steel Forms:
a. Smooth, Grade B (PCI).
2. Exposed Aggregate Finish Types: (Pattern and finish locations as indicated on the drawings.)
a. Water Wash finish: Use chemical retarding agents applied to molds, and washing and brushing procedures to exposed aggregate and surrounding matrix surfaces after form removal to match accepted sample or mockup units.
3. Smooth Accent Bands: As indicated on the drawings; maximum 1/2-inch deep for 3 inch thick exterior wythe.

C. Screed Side Finish.
1. Streaking is expected on screed side of architectural faced panels. Streaking is part of the finishing process and is best cleaned in field by painters or a line item option by precaster.

D. Form Side Non-Architectural Finishes "By PCI":
1. Standard Grade (PCI): Small surface holes caused by air bubbles ("bug holes"), normal color variations, normal form joint marks and minor chips and spalls should be considered acceptable.

E. Screed Side Non-Architectural Finishes "By Description":
1. Standard Float: Screed or float finish uniformed surfaces: Strike off and consolidate concrete with vibrating screeds to a uniform finish, float finish, if required. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. No major imperfections, honeycombing, or defects are permitted.

2.03 MATERIALS

A. All materials shall comply with the specifications, standards and codes quoted herein. The Architect/Engineer upon request shall be furnished satisfactory certification that all material incorporated in the precast concrete products comply with the requirements herein specified.

B. Forms: Material that will provide smooth/anticipated finish that meets the expectations of the Owner/Architect.

C. Form Release Agent: Non-staining type that will not impair anticipated finishes of the Owner/Architect and that will not inhibit field installed coatings, sealants, and adhesives.

D. Portland Cement: ASTM C150 - Type I or III: ASTM C150.
   1. Mix materials are as follows:
      a. Gray cement.
      b. White cement.
      c. Combination of gray/white cement; Match sample at Architects office.
      d. Integral Color; Match sample at Architects office.

E. Admixtures:
   1. Air entraining admixtures: ASTM C260.
   2. Water reducing, retarding, accelerating admixtures: ASTM C494.

F. Aggregates: ASTM C33 except that coarse aggregates for precast concrete surfaces exposed to damp conditions shall contain zero iron oxides.
   1. See approved samples for coarse and fine aggregates.
   2. Light weight aggregate structural components: ASTM C330.

G. Water: Potable or free from foreign materials in amounts harmful to concrete and embedded steel.

H. Reinforcing Steel: Reinforcing steel or mesh will be selected from the following materials to conform to precaster's design unless otherwise indicated on the drawings. Reinforcing bars shall not be welded without specific approval of Architect/Engineer.
   1. Bars:
      a. Deformed billet steel: ASTM A615.
      b. Deformed rail steel: ASTM A616.
      c. Deformed axle steel: ASTM A617.
      d. Deformed low-alloy steel: ASTM A706.
   2. Wire: Cold drawn steel: ASTM A82.
   3. Wire fabric:
      a. Welded steel: ASTM A185.
      b. Welded deformed steel: ASTM A497.

I. Strand: Uncoated, 7-wire, Stress-Relieved Strand: ASTM A416-Grade 250K or 270K.

J. Anchors and Inserts:
   1. Materials:
      a. Structural Steel: ASTM A36.
         1) Shop Primer: Manufacturer's standards.
            a) Location: Items protected by sealants or finish coatings.
         2) Hot Dipped Galvanized: ASTM A153.
            a) Location: Items left exposed unless otherwise indicated. Cold galvanize field welds.
         3) Zinc-rich Coating: MIL-P-21035, self-curing, one component, sacrificial.
            a) Location: As indicated.
         4) Cadmium Coating (Electroplated).
            a) Location: As indicated.

b. Stainless Steel: ASTM A666, type 304.
1) Location: As indicated.

K. Sandwich Panel Insulation:
1. Extruded Polystyrene Insulation with:
a. (R=5.4/in at 40°).
2. All panels are to be insulated unless indicated otherwise on the drawings.

L. Wythe connectors: Maximum connector size to be 12-gauge stainless steel pin to adequately tie the two wythe together. Consult precaster for thermal transfer analysis.

M. Other Items Cast-In to Precast Units:
1. Other Items: As indicated on the drawings.
2. Locations: As indicated on the drawings.

2.04 ACCESSORIES

A. Cement Grout: Type I (ASTM C150 / C150M), "Dry Pack", portland cement, sand and water having a minimum of 3,000 psi compressive strength at 28 days. (Approximately 3 to 1 sand/cement ratio.) Use "Cement Grout" unless "Non-Shrink Cement Grout" is specifically indicated by precast or structural engineer.

B. Non-Shrink Cement Grout: Per ASTM C1107/C1107M, Type III (ASTM C150 / C150M), "Dry Pack", portland cement, sand, and water having a minimum of 10,000 psi compressive strength at 28 days.

C. Bearing Pads:
1. Unless noted otherwise on the plans, Elastomeric Bearing Pads conforming to Division 2, Section 25 of AASHTO Standard Specifications for Highway Bridges shall be used.
2. The PCI Design Handbook, Eighth Edition, Part 5.1 through Part 5.5 shall be used for the design of bearing pads.
3. Teraflouroethylene (TFE) reinforced with glass fibers and applied to stainless or structural steel plates.

D. Sealants:
1. Refer to Section 07 92 00 – Joint Sealants.
2. Refer to Section 07 84 00 – Firestopping.
3. Tremco; Dymeric 240 FC.
4. BASF Sonneborn; MasterSeal SL2.
5. Backer Rod: Denver Foam or equivalent.
6. Provide products compatible with adjacent work.

E. Welding Materials: Per AWS D1.1/D1.1M, "Structural Welding Code – Steel"; compatible with materials being welded.

F. Welded Studs: Per AWS D1.1/D1.1M, "Structural Welding Code – Steel"; compatible with materials being welded.

G. Anchor Bolts: As designed by precast manufacturer, cast-in place by others.

H. Attachment Plates: As designed by precast manufacturer, cast-in place by others.

I. Other Load Bearing Loose Steel Items: As designed by precast manufacturer.

2.05 FABRICATION

A. Cast all wall panels with architectural finish face down.

B. Pre-stress each wythe of flat panel. No Exceptions.

C. Achieve final architectural finishes only by techniques specified within this specifications section. (Form Side Architectural Finishes “By Description”.)

D. Cast-in preservative treated 2x wood blocking at perimeter of window, man door, and louver openings. Wood nailers shall provide adequate backing for installation of window, door, and louver units. Return face finish to edge of blocking/insulation.

E. Cast solid concrete edges at the perimeter of sectional/overhead door type openings unless noted otherwise; 6-inch thick minimum. Return face finish to interior side of panel.

F. Cast-in bent steel plates at perimeter of sectional/overhead door type openings for attachment of door hardware. Continuously weld splices and grind smooth to a point that they are capable of being concealed by field painting.

G. All reinforcing steel shall have minimum cover as required by code and shall be accurately located as indicated on the approved shop drawings. Metal chairs, with or without coatings, shall not be permitted in the finished face.

H. Composite design acceptable when approved by architect/engineer.

I. All of the fabrication procedures shall be carried out under a fully protective overhead and sidewall covering, with a constant temperature of between 50 to 80 F being maintained except during the curing cycle.

2.06 FABRICATION TOLERANCES

A. Fabricate units in accordance with MNL-116, MNL-117, MNL-135 and as follows:
   1. Length: Plus or minus 1/8 inch for every 10 feet in length or 1/2 inch, whichever is greater.
   2. Width: Plus or minus 1/8 inch for items 48 inch or less; 1/4 inch for items 48 to 120 inches, and 1/2 inches maximum for items over 120 inches and more.
   3. Cross Sectional Dimensions: Plus or minus 1/8 inch for items 48 inch or less; 1/4 inch for items 48 to 120 inches, and 1/2 inches maximum for items over 120 inches and more.
   4. Cast-in Anchors and Inserts: Plus or minus 1 inch from centerline location indicated on shop drawings.
   5. Horizontal Alignment (Sweep): Plus or minus 1/3 inch for every 10 feet in length or 1/2 inch, whichever is greater.
   6. Vertical Alignment (End Squareness): Plus or minus 1/8 inch for every 12 inches in height or 1/4 inch, whichever is greater.
   7. Bowing (Camber): Variation between units is plus or minus 1/4 inch for every 10 feet in length or 1/2 inch, whichever is greater.
   8. Blockouts: Plus or minus 1 inch from centerline location indicated on shop drawings.

2.07 CONCRETE MIXES

A. 28-day compressive strength: Minimum of 5,000 psi.

B. Use of calcium chloride, chloride ions or other salts is not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify site is free of obstructions and ready to receive the work. Obstructions include but are not limited to dewatering of footing trenches, jobsite snow removal, site debris, overhead obstructions, including power lines.

B. Verify access roads have been prepared to handle all weather conditions and are acceptable to precast concrete installer.

C. Do not begin the work of this section unless preparations by the site contractor are complete and the site contractor understands and agrees to maintain acceptable conditions until precast installation is complete. Beginning the work of this section is acceptance of existing conditions.

3.02 PREPARATION

A. Preparation: Contractor (Buyer) shall be responsible for the following items:
   1. Removal of all obstructions including but not limited to power lines and wires that may be hazardous to precaster's personnel and other items required for precast installation.
   2. All-weather access roads for precaster's trucks and cranes. Refer to precaster's proposal/quotation for more defined access requirements.
   3. Grid locations, building corners, finish floor elevations, top of door elevations and other survey points/lines/elevations for accurate installation of precast units.
   4. True and level bearing surfaces on all field placed bearing walls and other field placed supporting units.
   5. Placement and accurate alignment of anchor bolts, plates, or dowels in column footings, grade beams, and other field placed supporting units.
   6. All shoring required for composite beams and slabs. Shoring shall have a minimum load factor of 1.5 x (dead load plus construction loads).
   7. Repair all concrete and bituminous surfaces damaged during precast installation. Examine surfaces with precaster before and after precast installation and coordinate efforts to minimize damage.

3.03 ERECTION

A. Precast installer shall be PCI Certified Erector in good standing with PCI.

B. Precast Unit Curing Procedures: Contact precaster for minimum curing requirements.

C. Erection Shall Be Defined As:
   1. Placing, aligning, and leveling the precast units in final positions in the structure on the designated supporting surfaces.
   2. Connection of precast units to each other, or to supporting structural units as indicated on the shop drawings.
   3. Removal of lifting hooks, if necessary.
   4. Cleaning and sealing of "Precast" to "Precast" joints. Joints include:
      a. Precast to precast including joints between interior and exterior units.
      b. Precast to bearing.

5. Sealing of “Precast” to “Other Materials” and joints that require “Firestopping” are NOT considered part of erection unless indicated otherwise.
6. Field repair and cleaning of architecturally finished surfaces: Refer to “Field Repair and Cleaning of Precast Units” at end of section.

D. Field Welding: Complete field welding using qualified personnel, equipment, and welding materials that are compatible to the base material.

E. Grouting:
1. Pack grout between bottom of precast walls and their bearing surfaces filling the entire area free of voids. Rake joints back at locations where backer rod and sealant is to be installed.
2. Contractor Responsibility: Contractor shall be responsible for providing “shelters/tarps” and “temp heat” for grouting when temperatures are below 40 degrees for a 24-hour period.

F. Patching:
1. All exposed connections shall be recessed and patched as per the intended use of the space these are exposed to.

3.04 TOLERANCES

A. Erect precast units level, plumb, square, true, and in alignment without exceeding the non-cumulative erection tolerances of PCI MNL 135. Position units so that dimensional errors do not accumulate and so joints remain aligned and uniform as erection progresses. Level out variations between adjacent units by jacking, loading, or any other feasible method as recommended by the manufacturer and acceptable to the Architect/Engineer.

B. In the event that precast units cannot be adjusted to conform to design or tolerance criteria, cease work and advise Architect. Execute modifications as directed by the Architect prior to resuming work.

3.05 SEALANT INSTALLATION

A. Contractor/Owner shall coordinate with the precast erector sealing of precast joints where required. The Contractor accepts responsibility if the precast joints above the roof deck and below grade are not sealed due to poor coordination/site conditions. The precast erector shall accept responsibility if precast joints are not sealed but were coordinated in a timely fashion by the Contractor/Owner.

B. Install backer rod and sealant according to product manufacturer’s instructions.

3.06 FIELD REPAIR AND CLEANING OF PRECAST UNITS

A. Repairs by Precast Erector: Repair chipping, spalling, cracking, and other damages to precast units after delivery to the jobsite in accordance with procedures of PCI Erectors Manual. After installation and repairs are completed, all additional damage is the responsibility of, and at the cost of, the Contractor. Consult with precaster for repairs of structural precast units.

B. Cleaning by Contractor: Clean exposed surfaces (not cleaned by precaster) that are soiled during shipping, installation, and remaining construction operations, prior to Substantial Completion. Clean in accordance with precast manufacturer's recommendations.

3.07 CLEANING BY PRECAST ERECTOR:

A. Protect adjacent work, buildings, and landscaping from damage caused by cleaning.

B. Schedule washing and cleaning procedures accordingly to minimize the number of trips to site. Washing and cleaning shall be completed at "one time", unless other trips are required to complete the work. After cleaning is completed, all additional cleaning is the responsibility of, and at the cost of, the Contractor.

C. Exterior Architectural Finishes: Wash and clean architectural finishes to remove road film, effloresces, and to even out color variations from panel to panel. Precast units shall be cleaned only after all installation procedures, including joint treatment, are completed. Perform cleaning and rinsing procedures in accordance with the precast manufacturer's recommendations.

D. Interior Face of Architecturally Finished Panels: Washing and cleaning is NOT part of the work covered by Precaster. "Color Streaking" will be evident on the backside/interior of architecturally finished panels.

3.08 INSPECTION AND ACCEPTANCE

A. Final inspection and acceptance of erected precast/prestressed concrete shall be made by Architect/Engineer to verify conformance with plans and specifications.

3.09 PROTECTION

A. Contractor shall protect precast units from damage during remaining construction operations.

END OF SECTION

SECTION 03 45 13

ARCHITECTURAL PRECAST CONCRETE SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Furnish all precast concrete windowsill and water table units.

B. Related Sections
   1. 04 21 13 – Brick Masonry.
   2. 04 22 00 – Concrete Unit Masonry.
   3. 04 71 16 – Manufactured Masonry Units.

1.02 SUBMITTALS

A. Submittals shall conform to Section 01 33 00.

B. Submit shop drawings showing product dimensions and connection details.

C. Submit two 12-inch by 12-inch samples of each type of finish required showing proposed color and finish for units.

1.03 WARRANTY

A. Warranty in accordance with Section 01 78 36.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cement: ASTM C150, Type 1, white color. Provide cement from 1 source of supply.

B. Aggregate: ASTM C33, 3/8-inch maximum size, white colored. Provide aggregate from 1 source of supply.

C. Water: Clean, potable, and free from deleterious amounts of oil, acid, alkali, or other foreign matter.

D. Air Entraining Admixture: ASTM C260.

E. Water Reducing Admixture: ASTM C494, Type A.

F. Fly Ash: ASTM A618.

G. Reinforcing Steel: ASTM A615, Grade 60.

H. Cast-In Anchors: Stainless steel, ASTM A276, Type 304.

I. Color: Concrete pigment as approved by Architect.

2.02 CONCRETE MIX PROPORTIONS

A. Concrete used for windowsills shall conform to the following minimum requirements:
   1. Minimum compressive strength at 28 days 4,000 psi.
   2. Entrained air content 6 percent ± 1-1/2 percent.

2.03 FABRICATION OF PRECAST CONCRETE UNITS

A. Fabricate units to the dimensions as shown on the Drawings.

B. Accurately place reinforcing units, inserts, anchor plates, and embedded items before concrete is placed.

C. Finishes:
   1. Provide smooth cast finish using smooth, non-porous molds.

D. Color/Finish: To be selected from manufacturer's full range of standard colors, light sand blast.

E. Cure precast units until 2,000 psi minimum compressive strength has developed before removing the units from the forms, unless greater strength is required for stripping.

PART 3 EXECUTION

3.01 TRANSPORTATION AND HANDLING

A. Transport units in a manner to avoid excessive stress and prevent cracking or chipping of units.

B. Support units during handling and stockpiling with sufficient hardwood shores to prevent cracking and spalling.

3.02 INSTALLATION

A. Do not install any units that are cracked or chipped.

B. Installation of units is included under Section 04 22 00.

END OF SECTION

SECTION 04 05 13

MORTAR

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Work under this section includes mortar for unit masonry.

B. Related Sections
   1. 04 21 13 – Brick Masonry.
   2. 04 22 00 – Concrete Unit Masonry.
   3. 04 71 16 – Manufactured Masonry Units.

1.02 REFERENCES

A. The following specifications and standards are incorporated by reference:
   1. American Society for Testing Materials (ASTM)
      a. C144 Standard Specification for Aggregate for Masonry Mortar.
      b. C150 Standard Specification for Portland Cement.
      c. C207 Standard Specification for Hydrated Lime for Masonry Purposes.
      d. C270 Standard Specification for Mortar for Unit Masonry.

1.03 TESTING AGENCY

A. Employ the service of an independent testing laboratory approved by the Architect or Engineer for testing of mortar specified herein.

1.04 SUBMITTALS

A. Test Reports: Submit information copies of all test reports in pdf format to the Architect, OWNER, Local Building Official, and SER.

1.05 WARRANTY

A. Warranty in accordance with Section 01 78 36.

PART 2 PRODUCTS

2.01 MORTAR MATERIALS

A. Portland Cement: ASTM C150, Type 1 or Type 2. Provide natural color or white cement as required to produce required mortar color.

B. Masonry Cement: Not allowed.

C. Hydrated Lime: ASTM C207, Type S.

D. Aggregates: ASTM C144.

E. Water shall be clean, potable, and free of deleterious amounts of acids, alkalis, or organic materials.

F. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes.
   1. Use only pigments with record of satisfactory performance in masonry mortars.
   2. Colors:
      a. At Architectural Precast Concrete: As approved by the Architect.
      b. At Concrete Unit Masonry: As approved by the Architect.
   3. Acceptable Manufacturers and Products:
      a. Centurion: Centurion Pigments.
      b. Rockwood Industries, Davis Colors: True Tone Mortar Colors.
      c. Solomon Grind-Chem Services, Inc.: SGS Mortar Colors.
      d. Prism Pigments: Mortar Colors.
      e. Or approved equal.

2.02 MEASURING AND MIXING

A. The method of measuring materials for the mortar used shall be by their volume or weight, and such that the specified proportions of the mortar can be controlled and accurately maintained. Measurement of sand by shovel shall not be permitted.

B. Cementitious material and aggregate shall be mixed for at least 3 minutes and not more than 5 minutes in a mechanical batch mixer with the maximum amount of water to produce a workable consistency.

C. Mix mortar as required for immediate use only. Discard any mixed for a period exceeding 2-1/2 hours. Non-colored mortar only may be re-tempered as required to restore proper consistency.

D. Mortar Proportions by Volume

Type	Parts by Volume of Portland Cement	Parts by Volume of Hydrated Lime	Aggregate Measured in a Damp, Loose Condition
M	1	1/4	Not less than 2-1/4 times and not more than 3 times the sum of the volumes of cement and lime used
S	1	Over 1/4 to 1/2	
N	1	Over 1/2 to 1-1/4	

E. Putty made from 92-percent hydrated lime may be used immediately after mixing.

2.03 MORTAR PROPERTIES

A. Mortar shall conform to the property specifications of ASTM C270 and the following:
   1. Compressive Strength: The average compressive strength of three 2-inch cubes of mortar shall not be less than the strength given in the following table for the mortar type specified:

Mortar Type	Average Compressive Strength at 28 Days (psi)
M	2,500
S	1,800
N	750

PART 3 EXECUTION

3.01 REFERENCE MASONRY

A. Reference Unit Masonry Sections for mortar types, color, installation, and protection requirements.

END OF SECTION

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SECTION 04 05 19

MASONRY ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Accessories related to masonry work as specified herein.

B. Related Sections
   1. 03 20 00 – Concrete Reinforcement.
   2. 04 21 13 – Brick Masonry.
   3. 04 22 00 – Concrete Unit Masonry.
   4. 04 71 16 – Manufactured Masonry Units.

1.02 REFERENCES

A. American Society for Testing Materials (ASTM)
   1. A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   2. C476 Standard Specification for Grout for Masonry.

1.03 SUBMITTALS

A. Product Data: Shall be manufacturers' printed data sheets on each product and application.

B. Shop Drawings: Provide graphic details of layout and installation.

C. Samples: Provide samples upon request.

D. Manufacturers' installation instructions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturers' original sealed packaging.

B. Store products away from direct sunlight, heat sources, and open flame. Replace damaged material before start of installation.

1.05 WARRANTY

A. Warranty in accordance with Section 01 78 36.

PART 2 PRODUCTS

2.01 REINFORCEMENT, ANCHORS AND TIES

A. Acceptable Manufacturers for Reinforcement, Anchors, and Ties:
   1. Hohmann & Barnard Company.
   2. Heckmann Building Products, Inc.

3. Masonry Reinforcing Corporation of America (Wire-Bond).
4. Or approved equal.

B. Deformed Reinforcing Bars for Wall Reinforcing: Provide under this Section to comply with requirements specified under Section 03 20 00.

C. Horizontal Reinforcement for Single Wythe Concrete Masonry Unit Walls: Ladder-type reinforcing with perpendicular cross rods spaced not more than 16 inches on center, complete with prefabricated corners and tees.
1. Wire Type and Gauge
   a. Side Rods: Smooth No. 9 cross wires.
   b. Cross Rods: Smooth No. 9 cross wires.
2. Size: Width to position side wires over masonry unit face shells.
3. Finish
   a. At interior walls use hot-dipped galvanized, ASTM A153, Class B-2, 1.50 ounce per square foot zinc coating.
4. Acceptable Manufacturers and Product
   a. Hohmann & Barnard Company: 220 Ladder-Mesh.
   b. Comparable product of other specified manufacturers.

D. Horizontal Reinforcing for Cavity Walls with Concrete Masonry Unit Back-Up: Ladder-type reinforcing with perpendicular cross rods spaced not more than 16 inches on center with eye and adjustable pintle design, complete with prefabricated corners and tees.
1. Wire type and gauge:
   a. Side Rods: Standard 9-gauge.
   b. Cross Rods: Standard 9-gauge.
2. Size: Width to position side wires over masonry unit face shells.
3. Finish: Hot-dipped galvanized, ASTM A153, Class B-2, 1.50 ounce per square foot zinc coating.
4. Acceptable manufacturers and product:
   a. Dur-O-Wal, a Hohmann & Barnard Company: DA3600 Ladur-Eye.
   b. Comparable product from other specified manufacturers.

E. Mesh Wall Ties: 1/2-inch square mesh of 16-gauge steel wire, 3-inch wide strip by length as indicated or required to provide not less than 2 inches of embedment in mortar joint.
1. Finish: Hot-dipped galvanized, ASTM A153, Class B-2, 1.50 ounce per square foot zinc coating.
2. Acceptable Manufacturers and Product:
   a. Hohmann & Barnard Company: MWT – Mesh Wall Ties.
   b. Comparable product of other specified manufacturers.

F. Expansion Ties at Concrete, Concrete Block, or Steel: Adjustable tie.
1. Finish: Hot-dipped galvanized, ASTM A153, Class B-2, 1.50 ounce per square foot zinc coating.
2. Acceptable manufacturer and product:
   a. Hohmann & Barnard Company: Slip-Set™ Stabilizer.
   b. Comparable product of other specified manufacturers.

2.02 ACCESSORIES

A. Backer Rods and Sealants: Provided.

B. Control Joint: As per detail.

C. Horizontal Joint Grout Barrier:
   1. Corrosion proof and biologically inert grout barrier which maintains positive bond in mortar joint.
   2. Acceptable manufacturer and product:
      a. Hohmann & Barnard Company: MGS – Mortar/Grout Screen.
      b. Comparable product of other specified manufacturer.

2.03 GROUTS AND CONCRETE FILL

A. Grout: ASTM C476, except masonry cement not permitted for vertically reinforced masonry. Compressive strength 3,000 pounds per square inch in 28 days, unless otherwise indicated. Not less than 9-inch slump at mixing and not more than 10-inch slump at placement.

PART 3 EXECUTION

3.01 INSTALLATION OF ACCESSORIES IN MASONRY

A. Wall Reinforcing: Insert wall reinforcing at courses specified in Section 04 22 00. Overlap reinforcing 6 inches, install prefabricated corner reinforcing, and extend into intersecting walls. Bend and overlap wires at wall ends, vertical control joints, or jambs.

3.02 CONTROL JOINTS

A. Control Joints: Provide constant width joint as detailed.

B. Interrupt wall reinforcing at control joints.

3.03 ANCHORAGE OF INTERSECTING WALLS OR PARTITIONS

A. Partitions Intersecting Bearing Walls and Exterior Walls: Use expansion ties every second course as detailed.

B. Partition intersection, other than that noted in Paragraph A, use prefabricated corners or tees.

END OF SECTION

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SECTION 04 05 31

CAVITY WALL FLASHING/DRAINAGE SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. An all-inclusive flashing/drainage system. Section includes Flashing, Cavity Wall Drainage, Drip Edge, Termination Bar and Weeps.

B. Related Sections
   1. 04 21 13 – Brick Masonry.
   2. 04 22 00 – Concrete Unit Masonry.
   3. 04 71 16 – Manufactured Masonry Units.

1.02 REFERENCES

A. Industry Standards
   1. ASTM.
   2. BIA.
   3. MCAA.
   4. BIA Tech Note: Brick Construction – #7 Water Penetration Resistance – Design and Detail.

1.03 DEFINITIONS

A. Terms:
   1. Cavity Wall Flashing.
   2. Foundation Sill Flashing.
   3. Through Wall Flashing.
   4. Termination Bar.
   5. Adhesive/Sealant for Flashing.

1.04 SUBMITTALS

A. Product data and installation instructions.

B. 2 sections demonstrating lap joint: Each 18-inch by 14-inch (457 mm by 356 mm).

C. Adhered flashing samples available.

1.05 WARRANTY

A. Warranty in accordance with Section 01 78 36.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Mortar Net Solutions™, 541 S. Lake Street, Gary, IN 46403, Ph: 800-664-6638, www.mortarnet.com. (Standard of quality).

B. Or approved equal.

2.02 PRODUCTS

A. Mortar Net's "TotalFlash" system. Provide custom configurations for headers and door openings. TotalFlash system consists of: Hyload Flashing, manufactured by Hyload, Inc.; Mortar Net Drainage/Weep System, Mortar Net Stainless Steel Drip Edge, if required and Mortar Net Termination Bar.
   1. TotalFlash System:
      a. Hyload Flashing:
         1) The Hyload Flashing Membrane is a 40-mil polymeric, reinforced, UV stable membrane, incorporating Dow's Elvaloy™ KEE polymer. It is used to manufacture the TotalFlash system in the following panel sizes:

12-inch by 5 feet (305 mm by 1,524 mm)	18-inch by 5 feet (457 mm by 1,524 mm)	24-inch by 5 feet (610 mm by 1,524 mm)

   2. Mortar Collection Device/Weep Tabs:
      a. Recycled polyester material impregnated with UV protection, biocide to resist mold and flame retardant. Woven mesh designed to allow moisture to migrate to the integrated weep tabs; product adhered to the Hyload Flashing.
         1) Thickness: 3/8-inch (9.25 mm).
         2) Height: 10-inch (254 mm).
         3) Length: 5 feet (1,524 mm).
   3. Drip Edge:
      a. 304 Stainless Steel Drip Edge pre-attached to the Hyload Flashing and designed to divert moisture away from the masonry wall.
         1) 28 gauge (0.014) 304 Stainless Steel with formed drip edge.
         2) Length: 5 feet (1,524 mm).
         3) Width: 2.0-inch (51 mm).
   4. Adhesive:
      a. Provided with system for lapping TotalFlash sections:
         1) Multi-Purpose/Structural Sealant/No Slump/Moisture Cure (Exceeds ASTM C920-94).
         2) NO VOC.
         3) 1 part.
         4) 10.3-ounce tubes.
   5. Termination Bar:
      a. Pre-attached termination bar is designed to fasten flashing system to the substrate or can be tucked into mortar joint.
         1) Termination bar manufactured from high-strength corrosion resistance plastic with pre-drilled holes for attachment.
         2) Length: 5 feet (1,524 mm).
         3) Hole spacing: 6 inches (152 mm).
   6. Screws:

a. Provided self-tapping hex head screws designed to allow attachment to Masonry, Concrete, Wood, or Steel Stud.
   1) #14 by 1-1/4.
   2) Quantity per box 100 (10 screws per 5-foot section).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install Flashing/Drainage System in accordance with manufacturer's installation instructions.

B. Install system as required by detailed Project Drawings for cavity wall drainage.

END OF SECTION

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SECTION 04 21 13

BRICK MASONRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Provide labor, materials, and equipment necessary for the complete erection of the face brick and related materials in accordance with the Drawings and these Specifications.
   2. Complete masonry work as shown and detailed on the Drawings and otherwise as required, including but not limited to the following:
      a. Mortar materials.
      b. Brick and other masonry unit materials.
      c. Masonry reinforcing materials.

B. Related Sections
   1. 03 45 13 – Architectural Precast Concrete Specialties.
   2. 04 05 13 – Mortar.
   3. 04 05 19 – Masonry Accessories.
   4. 04 05 31 – Cavity Wall Flashing Drainage System.
   5. 04 22 00 – Concrete Unit Masonry.
   6. 04 71 16 – Manufactured Masonry Units.
   7. 07 92 00 – Joint Sealants.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. C216 – Standard Specification for Facing Brick.
   2. C652 – Specification for Hollow Brick.

1.03 SUBMITTALS

A. Test Reports: Submit test reports in duplicate indicating compliance with applicable Specifications for compressive strength, absorption, weight, moisture content, and dimensions for each type of clay masonry unit.

B. Samples: 5 samples of each type of clay masonry units showing extreme variations in color and texture shall be furnished to the Architect for approval prior to delivery and installation.

1.04 HANDLING, DELIVERY, AND STORAGE

A. Handle, transport, and store at the Site in a manner that will avoid damage.

B. Clay masonry units shall be protected from wetting prior to use. The units shall be cubed on pallets at the time of manufacture and shall be delivered to the Site with waterproof coverings. It shall be the Contractor's responsibility to see that the units remain covered on the Project.

1.05 WARRANTY

A. Warranty in accordance with Section 01 78 36.

PART 2 PRODUCTS

2.01 FACE BRICK

A. Clay masonry units shall be of modular dimensions and shall conform to the ASTM C652, Grade SW, Type FBS. Variations in color and texture shall not exceed those of samples approved.
   1. Brick Sizes and Colors:
      a. **FBR-1:** Brick shall be jumbo utility (3-5/8 inch by 3-5/8 inch by 11-5/8 inch).
         1) Acceptable Manufacturers:
            a) Acme Brick.
            b) Minnesota Brick and Tile.
            c) Metro Brick, Inc.
            d) Tiger Stone & Brick LLC.
            e) Or approved equal.
         2) Color: River Red Velour as manufactured by Belden Brick. Other acceptable suppliers must submit samples for approval prior to bid due date.
      b. **FBR-2:** Brick shall be jumbo utility (3-5/8 inch by 3-5/8 inch by 11-5/8 inch).
         1) Acceptable Manufacturers:
            a) Acme Brick.
            b) Minnesota Brick and Tile.
            c) Metro Brick, Inc.
            d) Tiger Stone & Brick LLC.
            e) Or approved equal.
         2) Color: River Red Velour as manufactured by Belden Brick. Other acceptable suppliers must submit samples for approval prior to bid due date.
      c. **FBR-3:** Brick shall be jumbo utility (3-5/8 inch by 3-5/8 inch by 11-5/8 inch).
         1) Acceptable Manufacturers:
            a) Acme Brick.
            b) Minnesota Brick and Tile.
            c) Metro Brick, Inc.
            d) Tiger Stone & Brick LLC.
            e) Or approved equal.
         2) Color: River Red Velour as manufactured by Belden Brick. Other acceptable suppliers must submit samples for approval prior to bid due date.
      d. **FBR-4:** Brick shall be jumbo utility (3-5/8 inch by 3-5/8 inch by 11-5/8 inch). New brick shall be solid.
         1) Acceptable Manufacturers:
            a) Acme Brick.
            b) Minnesota Brick and Tile.
            c) Metro Brick, Inc.
            d) Tiger Stone & Brick LLC.
            e) Or approved equal.
         2) Color: Match color and texture of existing interior face brick.
   2. Brick shall be rated as “no efflorescence” when tested in accordance with ASTM C67.

2.02 MORTAR

A. Mortar proportioning and mixing is specified in Section 04 05 13.

B. Tempering: The consistency of mortar may be adjusted to the satisfaction of the mason.
   1. Use mortar within 2-1/2 hours after mixing.

C. Lay masonry in mortar of the type specified below, unless otherwise noted:

Kind of Masonry	Masonry Type
Load-bearing masonry in contact with the ground	M
Load-bearing construction and exterior single-wythe masonry	S
Exterior veneer masonry (Brick, stone, etc.)	S
Masonry other than above	N

D. Mortar Color: As selected by the Architect.

2.03 GRAFFITI CONTROL

A. Clear, water-based Defacer Eraser Sacrificial Coating SC-1 as manufactured by PROSOCO, Inc., or equal. Product shall conform to all limiting regulations for Volatile Organic Compounds (VOC's). Surface preparation and application shall conform to manufacturer's instructions.

PART 3 EXECUTION

3.01 LAYING BRICK

A. Install brick unit masonry to comply with BIA recommendations as modified herein:
   1. Install units plumb, true to line, and with level courses.
   2. Install face brick with full mortar joints at end, bed, and head joints with 3/8-inch thick mortar joints, unless otherwise indicated.
   3. Make masonry courses uniform in height.
   4. Make vertical and horizontal joints of equal thickness.
   5. Do not install cracked, broken, or chipped bricks.
   6. Verify the steel relief angles are in place where indicated on the Drawings.

B. Installation of Brick Ties:
   1. Anchor face veneer to backup system using individual ties as follows:
      a. Maximum Horizontal Spacing: 24 inches on center.
      b. Maximum Vertical Spacing: 16 inches on center.
      c. Provide not less than 1 tie for each 2 square feet of wall area.
      d. Space ties not more than 4 inches from end of panel, edge of opening, or other joints.

C. Mortar Joints in Brick: Tool joints when mortar is thumb-print hard using jointing tools of proper shape and size.
   1. Tool joints to a smooth, dense, concave surface.
   2. At Concealed Locations: Flush cut joints, unless otherwise indicated.

D. Bond Pattern for Brick: Lay brickwork in 1/3 running bond, unless otherwise indicated.

E. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement type joints, returns, and offsets. Avoid use of less than half sized units at corners, jambs, and where possible elsewhere.
   1. Provide cuts on exposed masonry units which are straight and true.
   2. Use special shapes and fractional units to keep cuts to a minimum.
   3. Cut masonry units to fit neatly around conduit or piping, outlet boxes, and similar items.
   4. Fully bond external and internal corners and intersections, unless otherwise detailed.
   5. Install face brick from exposed side.

F. Do not shift or tap masonry after mortar has taken initial set. Where adjustment must be made, remove mortar and install fresh mortar.
   1. Rock closures into place with head joints thrown against 2 adjacent bricks in place. Do not pound corners or jambs to fit stretcher units after setting in place. Where adjustments to corners or jambs must be made after mortar has started to set, remove mortar and install fresh mortar.

G. Keep face of brick clean and free of mortar droppings and smears.

H. Stopping and Resuming Work: Stop horizontal runs by racking back in each course; toothing is not permitted. When joining fresh masonry to set or partially set masonry, remove loose units and remove mortar interfering with fresh mortar bed.

3.02 CAVITY WALL CONSTRUCTION

A. Anchors shall be placed not greater than 24 inches on center horizontally and not greater than 16 inches on center vertically.

B. Provide additional ties spaced 16 inches on center around all openings.

C. Provide through-wall flashing and cavity weep system at the bottom of all cavity walls, above all windows, doors and openings, and under all windowsills, as indicated on the Drawings and as specified in Section 04 05 31.

D. At Cavity Wall Construction: Lay brick from exposed side with concave joints as described in BIA Technical Note No. 21.

E. Keep cavity clean as described in BIA Technical Note No. 21C.

3.03 CONTROL JOINTS

A. Install vertical control joints at locations indicated, but not less than specified below. Do not form a continuous span through movement joints, unless provisions are made to prevent in-place restraint of wall or partition movement.
   1. Within 5 feet of each corner.
   2. At mass changes in elevation.
   3. Not over 16 feet on center.
   4. Verify control joint locations with Architect.

B. Do not bridge control joints in masonry work with horizontal reinforcing or mortar.

C. Control joints shall be 3/8-inch-wide with 1/2 inch expanded polystyrene foam backer rod and caulk color to match brick.

3.04 TOOLING, CLEANING, POINTING

A. Tool joints in covered brick and brick below grade.

B. Tool joints in exposed interior and exterior face brick.
   1. Unless otherwise indicated on the Drawings, all exposed brick joints shall have concave joints made by tooling with a round jointer, slightly larger than the width of joint for weather tightness and appearance.

C. After mortar has cured thoroughly, clean exposed masonry. If stiff brushes and water do not suffice, clean masonry with cleaning materials and methods approved by the masonry manufacturer. Cleaning shall not result in discoloration of masonry.

D. At completion of work, point holes or defective mortar joints, and where necessary, cut out and re-point defective joints.

3.05 JOB CONDITIONS

A. Protection of Work:
   1. Wall Covering:
      a. During erection cover top of wall with strong non-staining waterproof membrane at end of each day or shutdown.
      b. Cover partially completed walls when work is not in progress.
      c. Extend cover minimum of 24 inches down both sides.
      d. Hold cover securely in place.

B. Staining:
   1. Prevent grout or mortar from staining the face of masonry to be left exposed or painted.
      a. Remove immediately grout or mortar in contact with face of such masonry.
      b. Protect all sills, ledges, and projections from droppings of mortar, protect door jambs and corners from damage during construction.

C. Cold Weather Protection:
   1. Preparation:
      a. If ice or snow has formed on masonry bed, remove by carefully applying heat until top surface is dry to the touch.
      b. Remove all masonry deemed frozen or damaged.
   2. Products:
      a. When brick suction exceeds recommendations of paragraph 1.03.A of this Section, sprinkle with heated water.
         1) When units are above 32 degrees F (0 degrees C), heat water above 70 degrees F (21 degrees C).
         2) When units are below 32 degrees F (0 degrees C), heat water above 130 degrees F (54 degrees C).
      b. Use dry masonry units.
      c. Do not use wet or frozen units.
   3. Construction requirements while work is progressing:
      a. Air temperature 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
         1) Heat sand or mixing water to produce mortar temperatures between 40 degrees F, (4 degrees C) and 120 degrees F (49 degrees C).
      b. Air temperature 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):

1) Heat sand or mixing water to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
2) Maintain temperatures of mortar on boards above freezing.

c. Air temperature 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):
1) Heat sand or mixing water to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
2) Maintain temperatures of mortar on boards above freezing.
3) Use salamanders or other heat sources on both sides of walls under construction.
4) Use windbreaks when wind is in excess of 15 mph.

d. Air temperature 20 degrees F (-7 degrees C) and below:
1) Heat sand or mixing water to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
2) Provide enclosures and auxiliary heat to maintain air temperature above 32 degrees F (0 degrees C).
3) Minimum temperature of units when laid: 20 degrees F (-7 degrees C).

4. Protection requirements for completed masonry and masonry not being worked on:
a. Mean daily temperature 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
1) Protect masonry from rain or snow for 24 hours by covering with weather-resistive membrane.

b. Mean daily temperature 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):
1) Completely cover masonry with weather-resistive membrane.

c. Mean daily temperature 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):
1) Completely cover masonry with insulating blankets or equal protection for 24 hours.

d. Mean daily temperature 20 degrees F (-7 degrees C) and below:
1) Maintain masonry temperature above 32 degrees F (0 degrees C.) for 24 hours by:
a) Enclosure and supplementary heat.
B) Other approved methods.

3.06 FIELD QUALITY CONTROL

A. Tests: Provide field quality control tests and inspections to comply with Section 01 40 00:
1. Initial Rate of Absorption Test: Verify initial absorption rate of brick is within acceptable limits. If excessive, reduce initial absorption rate of face brick with 0.025 ounce per square inch per minute by thoroughly wetting bricks with clean water 24 hours before installing.
2. Bond Strength Field Testing: Tests of bond strength to comply with ASTM C1072 between mortar and face brick for exterior walls at various times during progress of work. Construct 1 set of two 7-brick prisms for every 10,000 brick laid. Test prisms at 7 days and 28 days.

B. Random Field Brick Test: After first major delivery is made to the Site, Architect shall randomly select six (6) samples of each type for testing.
1. Test to comply with ASTM C216 or C652 and previously submitted data.
2. Random field brick test is provided under Section 01 40 00.
3. If brick fails to comply with requirements above, manufacturer/supplier shall pay all costs involved with replacement of brick already shipped. Retesting as directed by the Architect.

3.07 GRAFFITI CONTROL APPLICATION

A. Apply graffiti control to all exposed masonry surfaces. Test application on mock-up and review results with Architect before applying to building.

3.08 EXTRA MATERIAL

A. Provide to the City for replacement or repair stock a minimum of 100 brick units covering the full color range of the approved blends.

END OF SECTION

SECTION 04 22 00

CONCRETE UNIT MASONRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Work under this Section includes providing labor, materials, and equipment necessary for the complete erection of the concrete block and related materials in accordance with the Drawings and Specifications.
   2. Complete masonry Work as shown and detailed on the Drawings and otherwise as required, including but not limited to the following:
      a. Mortar materials.
      b. Block and other masonry unit materials.
      c. Masonry reinforcing materials.
      d. Miscellaneous bond beams and lintels.
      e. Grout for reinforced masonry walls.

B. Related Sections
   1. 04 05 13 – Mortar.
   2. 04 05 19 – Masonry Accessories.
   3. 04 05 31 – Cavity Wall Flashing/Drainage System.
   4. 04 21 13 – Brick Masonry.
   5. 04 71 16 – Manufactured Masonry Units.
   6. 09 91 00 – Painting.

1.02 REFERENCE STANDARDS

A. The following specifications and standards are incorporated by reference:
   1. American Society for Testing Materials (ASTM):
      a. C33 Standard Specification for Concrete Aggregates.
      b. C90 Standard Specification for Load-bearing Concrete Masonry Units.
      c. C140 Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
      d. C476 Standard Specification for Grout for Masonry.
      e. C1314 Standard Test Method for Compressive Strength of Masonry Prisms.
   2. American Institute of Concrete
      a. 530 Building Code Requirements and Specifications for Masonry Structures.

1.03 QUALITY ASSURANCE

A. Testing of Concrete Masonry Units:
   1. Test 3 concrete blocks of each type used in construction prior to starting masonry construction.
   2. Test concrete block for conformance to ASTM C90 in accordance with testing methods outlined in ASTM C140 and C426.
   3. No masonry construction will be allowed until CMU testing has been completed and accepted by SEOR.
   4. All costs of testing shall be paid by the Contractor.

B. Testing of Concrete Block Prisms:
   1. Construct and test masonry prisms in accordance with ASTM C1314.
   2. Construct and test 5 concrete block prisms as defined in 1.03.A.1.b prior to masonry construction. All prisms shall be ungrouted.
   3. Each prism shall consist of a minimum of 2 concrete masonry units laid in stack bond with full mortar beds. Units shall be representative of the units to be used in the construction and be either 8 inches or 12 inches wide by 16-inches long by 8 inches high.
   4. The acceptance test result shall be the average of each set of prisms tested 28 days after construction.
   5. Masonry prisms shall have a minimum compressive strength at 28 days of 2,000 psi.
   6. Contractor shall construct masonry prisms in the field, and store them undisturbed for 48 to 96 hours in a moisture-tight bag above 50 degrees F. The prisms shall then be transported undisturbed to the laboratory.
   7. No masonry construction will be allowed until concrete block prism testing has been completed and accepted by SEOR.
   8. All costs of preconstruction testing shall be paid by the Contractor unless required by Section 01 41 00.
   9. If prism tests fail to meet specified strength requirements, Contractor shall cut prisms from the finished masonry as directed by the Engineer. If prism tests fail to meet structural requirements, promptly remove and replace or reinforce as directed by the Engineer. Testing and remedial work shall be at no additional cost to the Owner.

1.04 SUBMITTALS

A. Test Reports: Submit test reports in duplicate indicating compliance with applicable Specifications for compressive strength, absorption, weight, moisture content, and dimensions for each type of masonry unit.

B. Prisms: Submit masonry prism test results in conformance with Section 01 40 00.

C. Water Proofers and Highlighting Sealers: Furnished and installed as specified in Section 09 91 00.

D. Block Certificates: Submit manufacturer's Block Certificates as required for each type and size of block used on the Project.

1.05 HANDLING, DELIVERY, AND STORAGE

A. Handle, transport, and store at the Site in a manner that will avoid damage.

B. Concrete masonry units shall be protected from wetting prior to use. The units shall be cubed on pallets at the time of manufacture and shall be delivered to the Site with waterproof coverings. It shall be the Contractor's responsibility to see that the units remain covered on the Project.

PART 2 PRODUCTS

2.01 MASONRY UNITS

A. Concrete masonry units shall be of modular dimensions; shall conform to the ASTM Specifications, and the modifying and additional requirements as indicated below:
   1. Hollow Load Bearing Units: ASTM C90.

2. Minimum compressive strength of 2,000 psi.
3. Unless otherwise noted, all units shall be normal weight aggregate (ASTM C33).
4. Bullnose block units shall be furnished and installed at jambs and where indicated on the Drawings.
5. **All CMU shall be Open Core ("H" block) style units.**

B. Reinforcement
1. Joint reinforcement shall be steel wire ladder type, 3/16-inch diameter manufactured in accordance with ASTM A-82, hot dipped galvanized in accordance with ASTM A153, Class B2.
2. Reinforcing steel shall be ASTM A615 Grade 60 deformed billet bars.

C. Grout
1. Grout 28-day strength compressive strength f_g shall be 2,500 psi.

D. Special Units:
1. Standard Concrete Block (**CMU**): Shall be 8 inches high, normal weight, and conforming to the requirements specified above. Provide bullnose edges at all outside corners.
a. Acceptable Manufacturers:
1) Amcon Block and Precast, Inc.
2) Anchor Block Company.
3) County Materials Corporation.
4) Or approved equal.

E. Burnished Concrete Block (**CMU-1**): Face size shall be 8-inches high by 16-inches wide, normal weight and conforming to the requirements specified above.
1. Acceptable Manufacturers:
a. Amcon Block and Precast, Inc.
b. Anchor Block Company.
c. County Materials Corporation.
d. Or approved equal.
2. Color: Match existing burnished CMU.

PART 3 EXECUTION

3.01 MORTAR

A. Mortar proportioning and mixing is specified in Section 04 05 13.

B. Tempering: The consistency of mortar may be adjusted to the satisfaction of the mason
1. Use mortar within 2-1/2 hours after mixing.

C. Lay masonry in mortar of the type specified below, unless otherwise noted:

Masonry Type	Masonry Type
Load-bearing masonry in contact with the ground	M
Load-bearing construction and exterior single-wythe masonry	S
Exterior veneer masonry (Brick, stone, etc.)	N
Masonry other than above	N

D. Mortar Color: As selected by the Architect.

3.02 LAYING UNIT MASONRY

A. Lay masonry in straight, uniform courses, plumb and true to line and plane, unless otherwise specified or indicated on the Drawings:
   1. Use face shell bedding with full coverage of face shells of hollow units, full bed for solid units.

B. Build in property anchors, ties, plates, beams, lintels, flashings, inserts, etc. which come in contact with masonry work:
   1. Consult other trades in advance and make provisions for installation of their work in order to build in Work specified under other Sections of these Specifications as the Work progresses.
   2. No cutting or drilling shall be done without the permission and instruction of the General Contractor.

C. Reinforce concrete block masonry work with wall reinforcing, starting at every second course in bearing walls and every second course in non-bearing walls:
   1. Bond facing units to backing with reinforcing and metal ties as specified.
   2. Corners and ends shall be formed by cutting and bending to fit by use of prefabricated corner units. Place reinforcing in the first and second bed joints above and below opening or recesses where possible.
   3. Terminate reinforcing on each side of control joints.

D. Fill Solid with Concrete or Grout:
   1. The entire core under bearing plates.
   2. Top course of bearing walls and around openings as shown on Drawings.

E. Masonry units shall be cut with saws and shall be free from broken or chipped corners. Shells and cross webs of hollow masonry units shall be loaded with mortar. Units shall be shoved in place so that joints are completely filled without pointing. Facing material shall be free from mortar smears.

F. Wetting of concrete units before laying is not permitted.

G. Construct bond beams as detailed.

H. Pattern: CMU courses shall be laid in running bond, unless otherwise noted on the Drawings.

I. Control and Expansion Joint:
   1. Install control and expansion joints at the following maximum spacings, unless otherwise indicated on Drawings:
      a. Exterior Walls: 20 feet on center and within 24 inches on 1 side of each interior and exterior corner.
      b. Interior Walls: 30 feet on center.
      c. At changes in wall height.
   2. Do not continue horizontal joint reinforcement through control and expansion joints.

3.03 JOINTS

A. Where new mortar joints join masonry that is partially set or totally set, the exposed surface of the set masonry shall be cleaned so as to obtain the best possible bond with the new work.

B. If it becomes necessary to stop a continuous horizontal run of masonry, step back a minimum of 1/2 unit length in each course. Toothing will not be permitted, except upon written approval of the Architect or Engineer.

C. Where cutting of exposed units is necessary, the cuts shall be made with a motor-driven masonry saw.

D. Exposed mortar head and bed joints in block walls shall have a thickness equal to the difference between the actual dimension and nominal dimensions of the unit, either in height or in width.

3.04 TOOLING, CLEANING, POINTING

A. Tool all unit masonry joints, including block covered by finishes and block below grade.

B. Tool joints in exposed interior and exterior concrete block.
   1. Unless shown on the Drawings, joints shall be tooled concave and smooth with a 5/8-inch round bar tool for weather tightness and appearance.

C. After mortar has cured thoroughly, clean exposed masonry. If stiff brushes and water are not adequate, clean masonry with cleaning materials and methods approved by the masonry manufacturer. Cleaning shall not result in discoloration of masonry.

D. At completion of Work, point holes or defective mortar joints and where necessary cut out and re-point defective joints.

3.05 PROTECTION OF WORK

A. Protect Facing Material, Sills, and Ledges Against Staining:
   1. Keep top of wall covered with non-staining waterproof coverings at end of day and when Work is not in progress at the wall.
   2. Anchor coverings securely, overhang at least 2 feet on each side of wall.
   3. When Work is resumed, clean off all loose mortar from top surface.

B. Lay no masonry when the temperature of the outside air is below 40 degrees F or is anticipated to fall below 40 degrees F, unless suitable means are provided to heat the masonry materials and maintain the completed work at a temperature of 40 degrees F.
   1. Mortar ingredients should be heated to produce mortar temperatures between 40 degrees F and 120 degrees F. Every effort should be made to produce consecutive batches of mortar with the same temperatures falling within this range. The mortar temperature after mixing and before use should be above 40 degrees F, maintainable either by auxiliary heaters under the mortar board or by more frequent mixing of mortar batches. Heated mortar should not become excessively hot (greater than 120 degrees F).

2. Cold Weather Requirements While Work is Progressing:
    a. Use dry masonry units with a surface temperature of not less than 40 degrees F. wet or frozen masonry units shall not be laid.
    b. Air Temperature 40 Degrees F to 32 Degrees F: Sand or mixing water shall be heated to produce mortar temperatures between 40 degrees F and 120 degrees F.
    c. Air Temperature 32 Degrees F to 25 Degrees F: Sand and mixing water shall be heated to produce mortar temperatures between 40 degrees F and 120 degrees F. Maintain temperatures of mortar on boards above freezing.
    d. Air Temperature 25 Degrees F to 20 Degrees F: Sand and mixing water shall be heated to produce mortar temperatures between 40 degrees F and 120 degrees F. Maintain temperatures of mortar on boards above freezing. Salamanders or other sources of heat shall be used on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 15 mph.
    e. Air Temperature 20 Degrees F and Below: Sand and mixing water shall be heated to produce mortar temperatures between 40 degrees F and 120 degrees F. Enclosure and auxiliary heat shall be provided to maintain temperature above 32 degrees F. Temperature of units when laid shall be not less than 20 degrees F.
3. Concrete block walls indicated to receive vertical reinforcing shall be maintained at a temperature of not less than 40 degrees F for a period of not less than 48 hours after the vertical reinforcing has been grouted. Contractor shall verify and document surface temperatures of the concrete block units prior to placement of grout at vertical reinforcing locations.
4. In order to avoid “thermal shock” in concrete block walls, the heat (either temporary or permanent) shall be turned on or off at a rate not to exceed 20 degrees per hour or approximately 50 degrees F per 24 hours.

3.06 GROUTING MASONRY

A. Grouting shall be placed by pouring in lifts not exceeding 5 feet in height. It shall be consolidated by vibrating during placement and reconsolidated after excess moisture has been absorbed but before plasticity is lost.

B. Special care shall be given to holding reinforcing steel in the proper position during the grouting operation. Utilize rebar positioners when necessary.

C. Install a horizontal joint grout barrier when flow-thru bond beam blocks are utilized. Do not use roofing felt or other materials that will inhibit bonding between the bond beam and the masonry below.

D. Stop grout placement 1-1/2 inches below bed joints to create a shear key between successive grout pours. Stop grout placement 1/2 inch below the top of masonry at bond beams.

3.07 TESTING

A. Prism tests on all widths and types of CMU shall be provided in accordance with Division 01. Copies of tests shall be distributed to the Architect/Engineer, the Owner, and the Local Building Inspector.

END OF SECTION

SECTION 04 71 16

MANUFACTURED MASONRY UNITS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Calcium silicate masonry units.
2. Mortar for unit masonry.
3. Reinforcement, anchorages, and accessories.

B. Related Sections:
1. 03 45 13 – Architectural Precast Concrete Specialties.
2. 04 05 13 – Mortar.
3. 04 05 19 – Masonry Accessories.
4. 04 05 31 – Cavity Wall Flashing/Drainage System.
5. 04 21 13 – Brick Masonry.
6. 04 22 00 – Concrete Masonry Units.
7. 06 10 00 – Rough Carpentry.
8. 07 92 00 – Joint Sealants.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:
1. All Work and costs of this Section shall be incidental to the Project and be included in the Total Base Bid.

1.03 REFERENCES

A. American Concrete Institute (ACI).

B. American Society for Testing and Materials (ASTM):
1. C177 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
2. C192 – Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
3. C270 – Standard Specification for Mortar for Unit Masonry.
4. D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
5. E2556 / E2556M – Standard Specification for Vapor Permeable Flexible Sheet Water Resistive Barriers Intended for Mechanical Attachment.

C. Building Materials Evaluation Commission.

D. International Code Council (ICC):
1. ES Report.

E. Masonry Standards Joint Committee (MSJC) of The Masonry Society.

F. Underwriters Laboratories (UL):
1. Classification File Number.

2. UL 723, Standard for Safety for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Reference Section 01 33 00 – Submittal Procedures; submit the following items:
   1. Product Data: Manufactured masonry and application materials including mortar color charts, and water resistive barrier.
   2. Samples: Panel containing full-size samples of specified manufactured masonry showing full range of colors and textures complete with specified mortar.
      a. Actual size of masonry sample approximately 12 by 12 inches (300 by 300 mm).
   3. Quality Assurance/Control Submittals:
      a. Qualifications:
         1) Proof of manufacturer qualifications.
         2) Proof of installer qualifications.
      b. Certificates: ICC-ES Report.
      c. Test Reports for physical properties.
      d. Manufacturer's Installation Instructions.

B. Closeout Submittals: Reference Section 01 70 00 – Execution Requirements: submit the following items:
   1. Maintenance Instructions.
   2. Special Warranties.

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications:
      a. Minimum five years' experience in producing manufactured masonry.
      b. Member of following organizations:
         1) MSJC.
         2) ACI.
         3) ASTM.
   2. Installer Qualifications: Company with documented experience in installation of manufactured masonry including minimum 5 projects within 400-mile radius of this Project.

B. Certifications:
   1. Current ICC-ES Report.
   2. UL: Classification File Number.
   3. Building Materials Evaluation Commission.
   4. HUD: Material Release Number.
   5. Texas Department of Insurance Product Evaluation.
   6. Florida Product Approval Number.

C. Field Samples: Provide in a location selected by Architect showing representative sample of installed product including penetration and termination details, corner detail, and mortar color and tooling.
   1. Reference Section 01 40 00 – Quality Requirements.
   2. Minimum Size: 4 by 4 feet (1200 by 1200 mm) Approved field samples may remain as part of completed Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Follow manufacturer's instructions.

B. Store moisture-sensitive materials in weather protected enclosures.

1.07 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Maintain materials and ambient temperature in area of installation at minimum 40 degrees F (4 degrees C) prior to, during, and for 48 hours following installation.

1.08 WARRANTY

A. Special Warranty: Provide manufacturer's standard limited warranty against defects in manufacturing for a period of 50 years following date of Substantial Completion.

1.09 MAINTENANCE

A. Extra Materials: Furnish extra manufactured stone material in a variety of shapes and sizes in quantity equal to three percent of the installed stone.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturers of calcium silicate masonry units having Products considered acceptable for use:
   1. Standard of Quality: Arriscraft International; Renaissance® Masonry Units, Old Country Building Stone.
   2. Other manufacturers will be considered provided samples are submitted 14 days minimum prior to Bid Due Date for review and approval.
      a. Alba Stone Products.
      b. Lee Masonry Products.
      c. Plasticrete.
      d. Or approved equal.

B. Substitutions: Other manufacturers must submit data showing their products complies with the minimum quality standards contained herein no later than 10 days prior to bid due date for review and consideration.

2.02 MORTAR MATERIALS

A. Mortar proportioning and mixing is specified in Section 04 05 13.

2.03 MANUFACTURED MASONRY MATERIALS

A. Calcium Silicate Masonry Units (**CSMU-1**): to ASTM C73, Grade SW; solid units having been pressure formed and autoclaved; 3-13/16 inch bed depth; modular sizes as indicated below, rugged chiseled finish on exposed faces and ends, with mitered ends for outside corners, and having the following typical average properties when tested to the identified standard:
   1. Compressive Strength: 6600 psi, to ASTM C170.
   2. Absorption: 8.8 percent, to ASTM C97.
   3. Density: 129 lbs/ft3, to ASTM C97.
   4. Modulus of Rupture: 770 psi, to ASTM C99.
   5. Modular sizes:
      a. GC23: 2-3/8" high, 3-7/8" bed, various lengths up to 23-5/8".
      b. GC35: 3-5/8" high, 3-5/8" bed, various lengths up to 23-5/8".
      c. GC52: 5-1/4" high, 3-1/2" bed, various lengths up to 23-5/8".
      d. GC81: 8-1/8" high, 3-3/4" bed, various lengths up to 23-5/8".

6. Color: Cobble Hill.
7. Product and Manufacturer's Name: Georgia Citadel® Building Stone by Arriscraft.
8. Texture: Tumbled finish on exposed faces and ends.
9. Pattern: Lay building stone units in random bond pattern, to the following percentage ratio, described from smallest to largest sized units: [20:20:40:20].

2.04 RELATED MATERIALS

A. Water Resistive Barrier: Vapor permeable flexible sheet water resistive barriers comply with ASTM E2556 / E2556M.

B. Install wall ties and anchorages as specified in Section 04 05 19 – Masonry Accessories.

C. Mortar: Premixed Type N, Type S or mortar mixed using components and proportions following manufactured masonry manufacturer's installation instructions. Comply with ASTM C 270.
   1. Mortar Color: As selected by Architect from manufacturer's standard colors.

D. Weep screed as required for installation over framed construction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify site conditions are ready to receive work.

B. Inspect materials for fit and finish prior to installation. Do not set unacceptable units.

C. Beginning of installation means acceptance of existing conditions.

3.02 CUTTING MASONRY UNITS

A. Cut masonry units to length with a masonry splitter.

B. Dress split end to match face when exposed in wall.

3.03 WETTING MASONRY UNITS

A. Where the ambient air temperature exceeds 100 degrees F or exceeds 90 degrees F with a wind velocity greater than 8 mph, pre-wet building stone units.

B. Lay wetted units when surface dry.

3.04 COURSING

A. Place masonry to lines and levels indicated.

B. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.

C. Lay building stone units in random bond pattern, to the following percentage ratio, described from smallest to largest sized units: [20:20:40:20].

D. Maintain mortar joint thickness of 3/8-inch.

E. Tool joints by compacting the surface when thumbprint hard, to a raked finish.

3.05 PLACING AND BONDING

A. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.

B. Fully bond intersections, and external corners.

C. Do not adjust masonry units after laying. Where resetting of masonry is required, remove, clean units and reset in new mortar.

D. Install wall ties and anchorages as specified in Section 04 05 19.

E. Install flashings, vents, and masonry accessories as specified in Section 04 05 31.

3.06 FIELD QUALITY CONTROL

A. Perform inspection and testing as specified in Section 01 40 00.

B. Architect Inspection: Architect will inspect installed masonry and reject masonry that is chipped, cracked, or blemished (streaked, stained or otherwise damaged), as described below.
   1. Masonry will be inspected to be free of cracks or other blemishes on the finished face or front edges of the masonry units exceeding 3/8 inch or that can be seen from a distance of 10 feet.
   2. Units shall exhibit a texture approximately equal to the approved sample when viewed under diffused daylight illumination at a 20-foot distance.
   3. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under diffused daylight illumination from a 20-foot distance.
   4. Efflorescence will not be cause for rejection.

C. Make Good rejected masonry as directed by Architect.

3.07 ADJUSTING AND CLEANING

A. Clean one-half of mock-up panel as directed below and leave for one week. If no harmful effects appear, all objectionable stains are removed and after mortar has set and cured, clean masonry as follows:
   1. Protect windows, sills, doors, trim and other work from damage.
   2. Remove large particles with stiff fiber brushes without damaging surface.
   3. Saturate masonry with clean water and flush off loose mortar and dirt.
   4. Dilute cleaning agent with clean water in controlled proportions.
   5. Apply solution to pre-soaked wall surface using low pressure acid-resistant sprayer.
   6. Thoroughly rinse cleaning solution and residue from wall surface.

B. Use alternative cleaning solutions and methods for difficult to clean masonry only after consultation with masonry unit manufacturer.

3.08 PROTECTION

A. Protect units from damage resulting from subsequent construction operations.

B. Use protection materials and methods which will not stain or damage units.

C. Remove protection materials upon Substantial Completion, or when risk of damage is no longer present.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Furnish and install all metal fabrications.

1.02 REFERENCES

A. American Society for Testing Materials (ASTM)
   1. A6 – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
   2. A36 – Standard Specification for Carbon Structural Steel.
   3. A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   4. A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
   5. A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   6. A153 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Hardware.
   7. A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
   8. A276 – Standard Specification for Stainless Steel Bars and Shapes.
   9. A307 – Standard Specification for Carbon Steel Bolts and Studs, 60 ksi Tensile Strength.
   10. A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing.
   11. A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
   12. A992 – Standard Specification for Structural Steel Shapes.
   13. B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   14. B308 – Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
   15. F436 – Standard Specification for Hardened Steel Washers.
   16. F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
   17. F3125 Grade A325 - 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.

B. Steel Structures Painting Council (SSPC)
   1. Paint Specification No. 13.

C. Aluminum Association (AA)
   1. Specification for Aluminum Structures.

D. American Institute of Steel Construction (AISC)
   1. Specification for the Design, Fabrication, and Erection of Structural Steel for Building. American Welding Society (AWS):

2. Structural Welding Code D1.1.

1.03 SUBMITTALS

A. Product Data: Submit product data or manufacturer's specifications indicating compliance with requirements specified herein.

B. Shop Drawings: Submit shop drawings indicating profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories. Indicate welded connections using standard AWS welding symbols.

1.04 PRODUCT HANDLING

A. Store materials to permit easy access for inspection and identification. Materials shall all be properly marked to identify the structure for which it is intended. Markings shall correspond to markings indicated on the shop drawings.

B. Keep steel members off the ground using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

PART 2 PRODUCTS

2.01 STEEL MATERIALS

A. Structural Steel Wide Flange Shapes: ASTM A992, unless otherwise indicated on the Drawings.

B. Structural Steel Channels, Angles, Plate, Bars, S- and M- Shapes: ASTM A36.

C. Hollow Structural Sections: ASTM A500, Grade B.

D. Steel Pipe: ASTM A53, Grade B, Schedule 40, unless otherwise indicated on the Drawings.

E. Anchor Bolts, Nuts, and Washers: Where bolts are anchored into concrete ASTM F1554, Grade 36, hot dipped galvanized per ASTM A153.

F. Bolts, Nuts, and Washers Connecting Steel to Steel: ASTM A325, 3/4-inch diameter, unless noted otherwise. Washers shall conform to ASTM F436.

G. Welding Electrodes and Fluxes: Conform to AWS D1.1.

H. Headed Stud-Type Shear Connectors: ASTM A108, Grade 1015 or 1020, cold finish carbon steel with dimensions complying with AISC specifications.

I. Shop Paint: Conform to Steel Structures Painting Council Paint Specification No. 13.

2.02 STAINLESS STEEL MATERIALS

A. Shapes, Bars, and Rods: ASTM A276, Type 316 or 316L.

B. Sheets, Strips, and Plates: ASTM A167, Type 316 or 316L.

C. Type 316L stainless steel shall be used for welded construction.

2.03 ALUMINUM MATERIAL

A. Aluminum Shapes: ASTM B308, Alloy 6061-T6.

B. Aluminum Sheet and Plates: ASTM B209, Alloy 6061-T6.

C. Bolts, Nuts, and Washers: 300 Series stainless steel.

D. Welding: Conform to AA Specification for Aluminum Structures.

2.04 CAST IRON MATERIALS

A. Cast iron shall comply with the requirements of the latest Standard Specification for Cast Iron Pipe and Special Castings of the American Society of Testing Materials.

2.05 ANCHORS

A. Expansion anchors for fastening to cast-in-place concrete shall be Hilti Type 316 Stainless Steel Kwik Bolts, or approved equal. Size as shown on Drawings.

B. Sleeve anchors for fastening to cast-in-place concrete and solid grouted masonry shall be Hilti Sleeve Anchors, or approved equal. Size as shown on Drawings.

C. Adhesive anchors for fastening to masonry shall be Hilti Standard HIT HY20 or HY150, or approved equal. Size as shown on Drawings.

D. Adhesive anchors for fastening to masonry shall be Hilti RE 500, or approved equal. Size as shown on Drawings.

2.06 FABRICATION

A. Verify dimensions on Site prior to shop fabrication.

B. Fabricate items with joints neatly fitting and properly secured. All tolerances for built-up and rolled shapes shall meet or exceed ASTM A6.

C. Use only materials which are smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled grade names, and roughness. Remove blemishes by grinding, or by welding and grinding prior to cleaning, treating, and application of surface finishes.

D. Shop fabricate and assemble in shop to greatest extent possible. Sections shall be full length pieces between connections or splices.

E. Grind exposed welds smooth and flush with adjacent finished surfaces.

F. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, unless otherwise specified in schedule herein.

2.07 SHOP PAINTING

A. Shop paint all steel fabrications.

B. Surface Preparation: After inspection and before shipping, clean steel to be painted. Remove loose rust, loose mill scale and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council Surface Preparation Specification No. 2 - Hand Tool Cleaning.

C. Shop Paint: Immediately after surface preparation, apply shop paint in accordance with manufacturer's instructions at a rate to provide a uniform dry film thickness of 1.5 mils minimum. Maintain minimum coverage at joints, corners, edges, and exposed surfaces.

D. In special areas indicated in Section 09 91 00 use primer compatible with painting systems used.

2.08 GALVANIZING

A. Galvanize structural shapes, plates, and bars in accordance with ASTM A123.

B. Galvanize hardware and miscellaneous items in accordance with ASTM A153.

C. All anchor bolts shall be galvanized, unless noted.

2.09 GALVANIZING COATING PAINT

A. Wash Primer: Vinyl butyral acid.

B. Primer: Converted epoxy, epoxy phenolic, or urethane type, minimum 14-pounds metallic zinc content per gallon.

C. Apply in strict accordance with manufacturer's specifications.

2.10 REPLACEABLE ABRASIVE STAIR TREAD NOSINGS

A. Aluminum: ASTM B 221, alloy 6063-T5 for extrusions.

B. Standard Abrasive: Two (2) part Epoxy combined with aluminum oxide grit.

C. Anchoring System for Two-Component Stair Nosings: Standard stair nosing anchors and stainless-steel tread plate securing screws.

D. Size: Length shall be 4 inches less than total width of stair tread.

E. Manufacturers (Cast-in-place concrete stairs):
1. American Safety Tread Co., Inc.: Model TP-311.
2. Balco, Inc.: Model DXH-330.

PART 3 EXECUTION

3.01 ERECTION

A. Install items square and level, accurately fitting, and free from distortion or defects. Shim and grout as necessary.

B. Make provision for erection stresses by temporary bracing. Keep work in alignment.

C. Replace items damaged in course of installation.

D. Perform field welding in accordance with AWS D1.1.

E. A325 Bolts: Tighten bolts and provide washers in accordance with “Specifications for Structural Joints” for ASTM A325 bolts.

F. Aluminum surfaces in contact with or embedded in concrete shall be coated with 2 coats of bituminous paint.

3.02 TOUCH-UP PAINTING AND CLEAN-UP

A. After installation, clean and touch up field welds, bolt connections, and scratched and damaged prime painted surfaces. Use a primer consistent with shop coat.

B. Repair damaged or scratched galvanized coatings. Solvent clean damaged area with a wash primer, 1 coat, 4-mil dry film thickness. Clean by hand tool, power tool, or brush off blast. Apply 3 coats of organic zinc paint with a minimum dry film thickness of 3 mils per coat.

3.03 SCHEDULE OF ITEMS

A. Supply and install metals indicated on the Drawings and listed herein complete with accessories, anchorages, and attachments necessary for complete installation.

B. Framing, Supports, and Lintels:
   1. Provide framing members, supports, and required connections as shown on the Drawings.
   2. Fabricate steel to sizes, shapes, and profiles shown. Unless otherwise indicated, fabricate steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware and similar items.

C. Concrete Stair Tread Nosing
   1. Furnish and install safety nosings on all concrete stair treads.
   2. The nosings shall be two-component aluminum replaceable and 3 inches wide.

3.04 TOUCH-UP PAINTING AND CLEAN-UP

A. After installation, clean and touch up field welds, bolt connections, and scratched and damaged prime painted surfaces. Use a primer consistent with shop coat.

B. Repair damaged or scratched galvanized coatings. Solvent clean damaged area with a wash primer, 1 coat, 4-mil dry film thickness. Clean by hand tool, power tool, or brush off blast. Apply 3 coats of organic zinc paint with a minimum dry film thickness of 3 mils per coat.

END OF SECTION

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SECTION 05 51 00

METAL STAIRS

PART 1 GENERAL

1.01 SUMMARY

A. Section specifies steel stairs with railings.
   1. Closed riser stairs with concrete filled treads and platforms.

B. Related Sections:
   1. 03 30 00 – Cast-In-Place Concrete.
   2. 04 22 00 – Concrete Unit Masonry.
   3. 05 50 00 – Metal Fabrications.
   4. 09 90 00 - Painting.

1.02 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

B. Shop Drawings: Show design, fabrication details, installation, connections, material, and size of members.

1.03 APPLICATION PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation.
   1. American Society for Testing and Materials (ASTM):
   2. A36/A36M-04 Structural Steel
   3. A47-99 (R2004) Ferritic Malleable Iron Castings
   4. A48-03 Gray Iron Castings
   5. A53-04 Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless
   6. A307-04 Carbon Steel Bolts and Studs, 60000 psi Tensile Strength
   7. A653/653M-04 Steel Sheet, Zinc Coated (Galvanized)or Zinc Alloy Coated (Galvannealed) by the Hot-Dip Process
   8. A563-04 Carbon and Alloy Steel Nuts
   9. A1008-04 Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low-Alloy
   10. A786/A786M-00 Rolled Steel Floor Plates
   11. A1011-04 Steel, Sheet and Strip, Strip, Hot-Rolled Carbon, Structural, High-Strength, Low-Alloy

B. C. American Welding Society (AWS):
   1. D1.1-00…….. Structural Welding Code-Steel
   2. D1.3-98…….. Structural Welding Code-Sheet Steel

C. The National Association of Architectural Metal Manufactures (NAAMM) Manuals:
   1. Metal Bar Gratings (ANSI/NAAMM MBG 531-93)
   2. 2nd Edition-1985 Pipe Railing Manual, Including Round Tube

D. American Iron and Steel Institute (AISI):
   1. Specification for the Design of Cold-Formed Steel Structural Members

PART 2 PRODUCTS

2.01 DESIGN CRITERIA

A. Design stairs to support a live load of 500 kg/m2 (100 pounds per square foot).

B. Structural design, fabrication, and assembly in accordance with requirements of NAAMM Metal Stairs Manual, except as otherwise specified or shown.

C. Design pipe railings in accordance with NAAMM Pipe Railing Manual for 900 N (200 pounds) in any direction at any point.

D. Design shall be in full compliance with 2020 Minnesota Building Code.

2.02 MATERIALS

A. Steel Pipe: ASTM A53, Standard Weight, zinc coated.

B. Sheet Steel: ASTM A1008.

C. Structural Steel: ASTM A36.

D. Steel Floor Plate: ASTM 786.

E. Steel Decking: Form from zinc coated steel conforming to ASTM A446, with properties conforming to AISI Specification for the Design of Cold-Formed Steel Structural Members.

F. Steel Plate: ASTM A1011.

G. Iron Castings: ASTM A48, Class 30.

H. Malleable Iron Castings: ASTM A47.

2.03 FABRICATION GENERAL

A. Fasteners:
   1. Conceal bolts and screws wherever possible.
   2. Use countersunk heads on exposed bolts and screws with ends of bolts and screws dressed flush after nuts are set.

B. Welding:
   1. Structural steel, AWS D1.1 and sheet steel, AWS D1.3.
   2. Where possible, locate welds on unexposed side.
   3. Grind exposed welds smooth and true to contour of welded member.
   4. Remove welding splatter.

C. Remove sharp edges and burrs.

D. Fit stringers to head channel and close ends with steel plates welded in place where shown.

E. Fit face stringer to newel post by tenoning into newel post, or by notching and fitting face stringer to side of newel where shown.

F. Shop Prime Painting: Prepare surface and apply primer as specified for ferrous metals in Section 09 91 00 – Painting.

2.04 RAILINGS

A. Fabricate guardrails, railings, and handrails, from galvanized schedule 40 or 80 steel pipe per details.
   1. Connections may be standard fittings designed for welding, or coped or mitered pipe with full welds.
   2. Wall handrails are provided under this section.

B. Return ends of handrail to wall and close free end.

C. Provide standard terminal castings where fastened to newel.

D. Space intermediate posts not over five feet on center.

E. Fabricate handrail brackets from cast malleable iron.

F. Provide standard terminal fittings at ends of post and rails.

2.05 CLOSED RISER STAIRS

A. Provide treads, risers, platforms, railings, stringers, headers, and other supporting members.

B. Fabricate pans for treads and platforms, and risers from sheet steel.

C. Form risers with sanitary cove.

D. Fabricate stringers, headers, and other supporting members from structural steel.

E. Construct newel posts of steel tubing having wall thickness not less than 5 mm (3/16-inch), with forged steel caps and drops.

PART 3 EXECUTION

3.01 STAIR INSTALLATION

A. Provide hangers and struts required to support the loads imposed.

B. Perform job site welding and bolting as specified for shop fabrication.

C. Set stairs and other members in position and secure to structure as shown.

D. Install stairs plumb, level and true to line.

E. Provide steel closure plate to fill any gap between the stringer and surrounding shaft wall. Weld and finish with prime and paint finish of adjoining steel.

3.02 RAILING INSTALLATION

A. Install standard terminal fittings at ends of posts and rails.

B. Secure brackets, posts and rails to steel by welds, and to masonry or concrete with expansion sleeves and bolts, except secure posts at concrete by setting in sleeves filled with commercial non-shrink grout.

C. Set rails horizontal or parallel to rake of stairs to within 3 mm in 3650 mm (1/8-inch in 12 feet).

D. Set posts plumb and aligned to within 3 mm in 3650 mm (1/8-inch in 12 feet).

3.03 FIELD PRIME PAINTING

A. When installation is complete, clean field welds and surrounding areas to bright metal, and coat with same primer paint used for shop priming.

B. Touch-up abraded areas with same primer paint used for shop priming.

C. Touch up abraded galvanized areas with zinc rich paint as specified in 09 91 00 - Painting.

END OF SECTION

SECTION 05 51 13

ALUMINUM STAIRS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Aluminum stairs and ships ladder engineered and detailed by fabricator.
   2. Contractor has option to provide either shop fabricated or factory fabricated systems complying with profiles and configurations indicated.

B. Related Sections
   1. 05 50 00 – Metal Fabrications.
   2. 06 10 00 – Rough Carpentry.
   3. 07 72 00 – Roof Accessories.
   4. 09 29 00 – Gypsum Drywall.

1.02 SYSTEM DESCRIPTION

A. Design Requirements: Fabricator's engineer shall provide engineering design and certification for entire stair system, including components, connections, and embedded materials. Comply with profiles and size limitations indicated.

1.03 SUBMITTALS

A. Product Data: Manufacturer's specification and technical data, including detailed specification of construction, fabrication, and recommended installation instructions.

B. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, including specific requirements indicated:
   1. Construction details, sizes of metal sections, thicknesses of metals, profiles, attachments, dimensions and field joints, method of support from structure, finishes, and work to be built-in or provided by other Sections.
   2. Welding: Indicate welded connections, both shop and field, using standard AWS welding symbols. Indicate net weld lengths.
   3. **Shop Drawings shall be signed by a Professional Engineer registered in the state in which the Project is located**:
      a. Do not submit design calculations.

C. Quality Control Submittals
   1. Statement of qualification for manufacturers and installers.
   2. Professional certifications.

1.04 QUALITY ASSURANCE

A. Installer's Qualifications: Firm experienced in installation of systems similar in complexity to those required for this Project.

B. Certifications: Perform design work of this Section under the direct supervision of a Professional Engineer registered in the state in which the Project is located.

1.05 PRODUCT HANDLING

A. Store materials to permit easy access for inspection and identification. Materials shall all be properly marked to identify the structure for which it is intended. Markings shall correspond to markings indicated on the shop drawings.

B. Keep aluminum members off the ground using pallets, platforms, or other means of support. Protect aluminum members and packaged materials from corrosion and deterioration.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aluminum Shapes: ASTM B308, Alloy 6061-T6.

B. Aluminum Sheet and Plates: ASTM B209, Alloy 6061-T6.

C. Bolts, Nuts, and Washers: 300 Series stainless steel.

2.02 COMPONENTS

A. Design and fabricate aluminum stairs to comply with recommendations of NAAMM Metal Stair Manual.

B. Aluminum Stair/Ships Ladder Fabrication: Fabricate to dimension requirements and configurations indicated:
   1. NAAMM Classification: Industrial class (Ships Ladder).
   2. NAAMM Classification: Service class.
   3. NAAMM Classification: Commercial class.
   4. Design Loading
      a. Design and fabricate stairs, landings, and component connections to support live loads of not less than 100 pounds per square foot creating a deflection not to exceed the lesser of 1/360 of span or 0.25 in.
      b. Design and fabricate treads to support a concentrated load of 300 pounds on a 4-inch square area centered on tread length.
      c. Design and fabricate integral guardrails, railings and component connections to be capable of resisting a load of 200 pounds applied in any direction at any point on the top rail and a vertical and horizontal thrust of 50 pounds per lineal foot applied to the top railing without permanent set or damage. The 2 loads are not cumulative. Stair guardrail and handrail components shall not be less than those shown in Paragraph 2.02.B.
   5. Stringers: Profile and sizing by fabricator using channel, unless otherwise indicated.
   6. Treads: Grating Type:
      a. Layout and design by fabricator.
   7. Landings (Platform): Grating Type:
      a. Layout and design by fabricator.

C. Aluminum Guardrail and Handrails
   1. Furnish and install aluminum pipe guardrails and handrails as shown on the Drawings.

2. Stair guardrail pipe rails and posts shall be welded 1-1/2 inches (1.9 inches O.D.), Schedule 80, aluminum alloy 6061-T6 pipe.
3. Stair handrail pipes and returns shall be welded 1-1/4 inches (1.66 inches O.D.), Schedule 40, aluminum alloy 6061-T6 pipe. Provide clear anodized finish.
4. Stair guardrail and handrail pipe rail heights, spacing, and mounting details shall be as shown on the Drawings.
5. Fabricate stair railings in largest sections possible to minimize field connections.
6. Field splices shall be not more than 6-inches from a support post or bracket.
7. Field connections shall be tightly fitting sleeve type connections with sleeve projecting a minimum of 3 inches into each rail. Provide a minimum of 2 flush set rivets on each side of connection.
8. All ends of stair railings shall terminate at posts or shall be provided with a return section. Railings against walls shall be supported with wall brackets to underside of rails. The exposed ends of all railings and posts shall be capped.
9. All aluminum, including rails, posts, and brackets, shall be provided with a mill finish, unless otherwise indicated.
10. Aluminum surfaces in contact with or embedded in concrete shall be coated with 2 coats of bituminous paint.

D. Handrail Wall Brackets: Aluminum, 2-inch by 2 1/2-inch wall plate, center of rail located to maintain 1 1/2-inch clearance between rail and face of wall:
   1. Acceptable Manufacturers and Product:
      a. Julius Blum and Company, Inc.: No. 477.
      b. R and B Wagner, Inc.: No. SA515.
      c. Or approved equal.

2.03 ACCESSORIES

A. Fasteners: Determined by fabricator for specific application, unless specific fastener is indicated:
   1. Bolts, Nuts, Washers, and Other Fasteners: As recommended by the manufacturer/fabricator:
      a. Expansion anchors for fastening to cast-in-place concrete shall be Hilti Stainless Steel Kwik Bolts, or approved equal. Size as shown on Drawings.
      b. Adhesive anchors for fastening to masonry shall be Hilti HIT HY 150 or approved equal. Size as shown on Drawings.

B. Non-Metallic Shrinkage Resistant Grout: in accordance with Section 03 60 00.

2.04 GENERAL FABRICATION OF ALUMINUM STAIRS/SHIPS LADDER

A. When cutting, shearing, and forming, leave clean, true uniform lines and surfaces, free from buckles and twists. Remove burrs from cut edges.

B. Welding: Comply with AWS D1.2:
   1. On connections exposed in finished work, grind welds smooth and flush with adjacent surfaces. Welds shall be finished to match adjacent mill aluminum surfaces.

C. Mechanical Fastening (Bolts and Screws): Except where welded connections or other connections are indicated, provide mechanical fasteners for field connections. Connections shall be designed by the fabricator, unless detailed on Drawings:
   1. Conceal mechanical fasteners whenever possible. Where not possible to conceal, use flush countersunk type, unless indicated otherwise.

D. Make exposed mechanically fastened joints flush butt type hairline joints.

E. Supply components required for proper anchorage of aluminum fabrications. Fabricate anchorage and related components of same material and finish as aluminum fabrication, unless otherwise indicated.

F. Shop assembles in largest practical sizes that can be easily handled through building openings and accessibility routes.

G. Coordinate ships ladder fabrication with odor control tank vendor.

2.05 FINISHING

A. Aluminum surfaces in contact with or embedded in concrete shall be coated with 2 coats of bituminous paint.

B. Exposed aluminum stair member surfaces shall be mill finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper and timely completion.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install stairs square, level, plumb, and free from distortion or defects detrimental to appearance and performance.

B. Align stairs with adjacent construction.

C. Install nosings at stair/ships ladder tread and landing edges to comply with manufacturer's recommendations.

D. Perform cutting and altering work to provide for installation of work of other Sections that does not affect stair appearance or structural integrity.
   1. Do not perform cutting and altering that will affect appearance or structural integrity without Architect's review.

E. Field Welding: Perform same as specified for welding under Fabrication in Part 2 – Products:
   1. Touch up welds to match adjacent mill finish.

F. Field Mechanical Fastening: Perform same as specified for mechanical fastening under Fabrication in Part 2 - Products.

3.03 CLEANING

A. Clean field welds, bolt connections, and scratched or damaged surfaces to match adjacent mill finish.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 DESCRIPTION

A. Work under this Section Includes:
   1. Dimension/framing lumber.
   2. Bracing, blocking, sills, nailers and miscellaneous components.
   3. Rough framing connection and anchorage hardware.
   4. Related accessories and miscellaneous materials.

1.02 REFERENCES

A. American Society of Testing Materials (ASTM):
   1. A307 – Specification for Carbon Steel Bolts and Studs.
   2. D226 – Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

1.03 SUBMITTALS

A. Product Data: Manufacturer's specifications and technical data, including the following:
   1. Detailed specification of construction and fabrication.
   2. Manufacturer's installation instructions.

B. Shop Drawings: Show dimensioned layout, materials provided, connection details, etc.

C. Samples: Submit as requested by the Architect/Engineer.

1.04 QUALITY ASSURANCE

A. Lumber Standards: Conforming to Voluntary Product Standard PS20. Mark material with official grade mark of specified agency. Grading rules of the following agencies apply:
   1. West Coast Lumber Inspection Bureau (WCLIB).
   2. Western Wood Products Association (WWPA).
   3. Southern Pine Inspection Bureau (SPIB).
   4. Redwood Inspection Service (RIS).

B. Plywood Standards: Conforming to Voluntary Product Standard PS1 and identified with appropriate grade and trademark of American Plywood Association (APA). Mark material with official grade mark of specified agency.

C. Lumber Certification: Identified with grade stamp of an agency certified by National Forest Product Association (NFPA):
   1. Dimensional Work: Conform to NFPA "National Design Specifications for Stress-Grade Lumber and Its Fastenings."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection: Comply with manufacturer's recommendations:
   1. Store lumber and plywood not less than 6 inches above ground on framework of blocking, and cover with protective waterproof covering providing for adequate air circulation or ventilation.
   2. Protect corners of sheet materials from damage while handling.
   3. Fire Retardant Materials: Comply with treatment manufacturer's requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Framing Lumber: Nominal and actual dimensions conforming to PS20, not more than 19-percent moisture content, surfaced 4 sides (S4S), unless otherwise indicated:
   1. Douglas Fir, Larch, Hem-Fir: Grade WCLIB or WWPA No. 2, or better.
   2. Southern Pine: Grade SPIB No. 2, or better.
   3. Southern Yellow Pine: Grade SPIB No. 2, or better.
   4. Mixed white woods (S-P-F): No. 2, or better.

B. Exposed Blocking and Other Miscellaneous Wood Framing:
   1. Construction Grade No. 1, or better, Douglas Fir-Larch, Hem-Fir, and Western Hemlock, or mixed white woods (S-P-F).
   2. Where Exposed Material: Sound, straight, clean, and smooth (sand if required).

C. Concealed Blocking: Standard Grade No. 2, or better, Douglas Fir-Larch, Hem-Fir, Western Hemlock, Southern Pine, or mixed white woods (S-P-F).

D. Wood Furring Strips: Thickness as indicated on Drawings, or equivalent thickness to match infill material, but not less than 2-inches wide by 3/4 inch thick.

2.02 PRESERVATIVE TREATMENT

A. Wood Preservative Treatment: Lumber and plywood shall be pressure impregnated with Copper-8 Quinolinolate oil-borne water repellent fungicide by Hoover Treated Wood Products, Inc.:
   1. Deliver treated wood with moisture content specified for untreated wood. Treat wood after cutting to shape, except cutting to length may be done in the field.
   2. Treat and quality mark each piece over 1-inch by 4- inches, following AWPB standards.
   3. Acceptable Manufacturers and Products:
      a. Hoover Treated Wood Products, Inc.: Cop-8.
      b. Hickson Corporation: Natural Select™ Wood.
      c. Osmose Wood Preservers Company of America, Inc.: Advance Guard®.

B. Schedule of Preservative Treatment:
   1. AWPB, LP-22 (60-percent retention), or equivalent:
      a. Wood set into ground or concrete.
   2. AWPB, LP-2 (40-percent retention), or equivalent:
      a. Treat wood used in connection with roofing, flashing, and waterproofing.
      b. Wood in contact with concrete or masonry construction, including sills, plates, nailers, and blocking.
      c. Other materials indicated as "treated" on Drawings.

2.03 ACCESSORIES

A. Rough Hardware – General: Furnish rough hardware required, including nails, screws, anchor bolts, J-bolts, lag screws, cinch anchors, strap anchors, toggle bolts, shot anchors, and similar items:
   1. Select rough hardware of proper size and type for use intended and for materials to be fastened. Furnish sufficient hardware to ensure substantial and positive anchorage.
   2. Use hot dip galvanized or aluminum at exterior work.

B. Nailing into wood plugs is not acceptable for any Work. Where shot anchors are used, they shall be of type and size recommended by manufacturer for conditions of use.

C. Bolts: Course thread, not plated with washers and nuts.

D. Anchor Bolts With Nuts and Washers: ASTM A307, 1/2 inch diameter, unless otherwise indicated, threaded 1 end with 1-1/2 inch right angle bend opposite end. Determine bolt length by the following embedment requirements:
   1. Not less than 7-inch embedment into concrete or horizontal masonry joints.
   2. Not less than 15-inch embedment into vertical masonry joints.

E. Expansion Bolts: Hilti Stainless Steel Kwik Bolts, or approved equal. Size as shown on Drawings.

F. Adhesive Anchors: Heavy-duty vinylester resin adhesive anchors sized by manufacturer for specific application and substrate:
   1. Acceptable manufacturers and products:
      a. Hilti Corp.: HIT Anchor Series.
      b. Comparable products by The Rawlplug Company, Inc.

G. Nails: Bright finish steel for interior and galvanized steel for exterior.

H. Membrane Tape: 30 mil thick rubberized asphalt and polyethylene seam tape. Apply around windows, exterior frames, louvers, etc.:
   1. Width: 6-inches;
      a. Acceptable Manufacturer and Product.
      b. W. R. Grace & Co., Construction Products Division: Perm-A-Barrier wall seam tape.

I. Building Paper: 15-pound asphalt saturated felts conforming to ASTM D226 with a perm rate of 5 perms (non-perforated).

J. Construction Adhesive: Conform to APA Specification AFG-01.

K. Wire Mesh: Contractor has the option to use any of the following:
   1. 2-inches square, welded wire mesh, pre-galvanized. Wire size 0.080 inch, McNichols Co., or similar.
   2. 2-1/2 inch square galvanized interwoven diamond wire mesh. 11-gauge.
   3. 1/4 inch mesh by 23-gauge galvanized hardware cloth, 30 inch rolls.

PART 3 EXECUTION

3.01 ERECTION

A. Install all Work plumb, level, true, and square.

B. Use appropriate nails and glue for materials to be installed.

C. Do not notch, bore, or cut members for pipes, ducts, conduits, or other reasons, except as shown on the Drawings or as approved by the Engineer.

D. Provide full bearing for members. Where framing members slope, cut or notch ends to give uniform bearing surface.

E. Make all studs single length and unspliced.

F. Frame all corners and intersecting walls with 3 or more studs.

G. Apply preservative treatment at all field cuts, drilled holes, or other areas where pre-treatment has been damaged.

3.02 FASTENING

A. Use common wire nails of the size and quantity specified in the Building Code, unless shown otherwise.

B. Remove and replace all split wood.

C. Drill bolt holes 1/16 inch larger in diameter than the bolts being used.

D. Use washers under head and nut of all bolts.

E. Pre-bore holes for lag screws the same diameter as the root of the thread.

F. Screw all lag screws and wood screws into position. Do not drive.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Work under this Section includes furnishing and/or installing finish carpentry and related work. Items include, but are not limited to:
   1. Plastic laminate casework.

B. Related Sections:
   1. 04 22 00 – Concrete Unit Masonry.
   2. 06 10 00 – Rough Carpentry.
   3. 06 61 16 – Solid Surface Fabrications.
   4. 09 29 00 – Gypsum Drywall.
   5. 09 91 00 – Painting.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:
   1. All Work and costs of this Section shall be incidental to the Project and be included in the Total Base Bid.

1.03 QUALITY ASSURANCE

A. Architectural Woodwork Institute, AWI, lumber custom grade or better.

B. AWI Quality: Premium grade, unless noted otherwise in this Specification.

1.04 SUBMITTALS

A. Shop Drawings: Submit complete working fabrication and installation drawing and catalog cuts of each hardware item, in accordance with Article 3 of the General Conditions and Section 01 33 00.

B. Samples: Submit sample of each wood species which is to receive transparent finish at Site, of each finish to be applied at factory and plastic laminates for color selection.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect millwork during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.

PART 2 PRODUCTS

2.01 BASIC MATERIALS

A. General: Except as otherwise indicated, comply with the following requirements for architectural millwork not specifically indicated as prefabricated or prefinished standard

products. Provide brackets, fasteners, and supports as required or indicated for a complete installation.

B. Wood Moisture Content: Provide Kiln-dried lumber with an average moisture content range of 5 percent to 10 percent. Maintain temperature and relative humidity during fabrication, storage and furnishing operations so that the moisture content doesn't exceed 8 percent.

C. Wood for Transparent Finish: Plain sawn, red oak.

D. Shelves: Plywood with a hardwood edge.

2.02 LAMINATE MATERIALS

A. Approved Plastic Laminate Manufacturers
   1. Nevamar.
   2. Wilsonart.
   3. Formica.
   4. Or other approved equal.

B. High Pressure Decorative Plastic Laminate **(PLAM)**: High pressure plastic laminate conforming to NEMA LD-3, of the following grades:
   1. Horizontal grade plastic laminate: Conforming to NEMA Grade HGS, 0.048 inch nominal thickness.
   2. Post forming grade plastic laminate: Conforming to NEMA Grade HGP, 0.042 inch nominal thickness.
   3. Vertical grade plastic laminate: Conforming to NEMA VGS, 0.028 inch nominal thickness.
   4. Colors:
      a. **PLAM-1:** Natural Gray Felt 4971-PA by Wilsonart for countertops.
      b. **PLAM-2:** Fashion Grey D381-60 Matte by Wilsonart for base and wall cabinets.

C. Backer Plastic Laminate: Conforming to NEMA Grade BKL, same thickness as laminate on exposed side.
   1. Color: Fabricator's option to use black, brown, or undecorated.

D. Cabinet Liner: Conforming to NEMA Grade CLS or melamine overlay.
   1. Color: White.

2.03 CORE MATERIALS

A. Coreboard: Particleboard, conforming to ANSI A208.1, M-2 or medium density fiberboard conforming to ANSI A208.2, Grade 130-F21.

B. Water-resistant Coreboard: Water-resistant medium density particleboard, conforming to ANSI A208.1, M-2-Exterior Glue-MR50 or water-resistant medium density fiberboard conforming to ANSI A208.2, Grade 130-F21-MR50. Provide water-resistant coreboard full length on countertops with sinks.

2.04 CABINET HARDWARE

A. General: Cabinetwork shall be complete with all hardware required including the following:

1. Shelf adjustment clips shall be twin pin non-rotating shelf clip. Furnish four additional shelf clips for each wall cabinet for owner stock.
2. Rear supported adjustable shelves.
   a. Standard shelving (12" deep): K & V No. 83 ANO standards and Nos. 183L or 183R ANO right hand flange brackets.
   b. Heavy duty or wide shelving (14" to 18" deep): K & V No. 87 A standards and No. 187 LL A brackets 12", 14", 16", or 18" long with lock lugs. Provide one K & V No. 211 shelf rest per bracket.
3. Drawer Slides: Full extension three-piece telescoping slide with a load carrying capacity of 100 lbs.
   a. Standard Drawer Slides: KV8400 series, Wurth Pro 100 Series or approved equal.
4. Door and Drawer Pulls
   a. Surface Mounted: Stanley 4484, 5/16" X 4" or 5/16" x 3 1/2" wire pull , US26D dull chrome, or Amerock #943 SCH, 5/16" x 4 5/16" (4" CTC) wire pull, Brushed Chrome finish. Mount on drawers horizontally; on doors and tall cabinets vertically. Select width as necessary if matching existing hardware.
   b. Recessed: Haefele 151.35.208 mortise pull, Zinc Matte Nickel, mount horizontally on drawers and vertically on doors and tall cabinet.
5. Cabinet hinges: Use the hinge style that matches the existing condition of that building.
   a. Fixed pin, five knuckle, dull chrome, 2 1/2 inch fastened with 4 screws each let into faces, no edge fastening allowed. 2 3/4 inch overlay hinges Model Series IHB 376-26D by Rockford Process Control, Inc., Rockford, Illinois, are acceptable.
   b. 2 3/4" overlap hinge Model Series IHD 376-260 by Rockford Process Control.
   c. European Style Concealed.
6. Closet Rods: 1 1/4" stainless steel.
7. Coat Hooks: Ives IV581B26 and IV582B26.
8. Locks: Contact DTC, SMC, or RMC Lock Shop for specific facility application and details.
9. Adjustable Shelf Clips:
   a. Intrinsic Shelf Rest: 5mm double pin to fit ¾" or 1" shelves.
   b. Double pin shelf clip. Specify ¾" shelf thickness. (Available through Bear Supply - Chicago, IL)
   c. LSI: Double pin shelf clips.
10. Storage unit magnetic catches: Ives 327 - 1 per pair of leaves - mount on underside of fixed middle-shelf.
11. Silencers: Glynn-Johnson #65; two at each door and drawer.

2.05 PLASTIC LAMINATE MILLWORK FABRICATION

A. Quality Grade: Workmanship of high pressure laminate shall conform to Premium Grade requirements of AWI Quality Standard, unless noted otherwise.

B. Laminate Fabrication: Apply laminate finish in full interrupted sheets consistent with manufactured sizes. Use cabinet liner at non-exposed surfaces, behind doors or in drawers. Glue joints in shop, using hardwood spline, except where field joints are necessary for shipping or placing in work. Prepare countertop field joints in shop using bolt-up Tite-Joint fasteners at spacing recommended by fastener manufacturer. Unless specifically shown otherwise, apply matching laminate to exposed edges (including back edge not tight to wall) and provide approved bevel edge at joint with face or top. Seal core surfaces not laminate-faced with clear synthetic resin sealer recommended by laminate manufacturer.

C. Cabinet Fabrication
   1. Cabinet style: Provide reveal overlay cabinet construction unless noted otherwise.
   2. Sub-top.
   3. All cabinet ends are to receive plastic laminate regardless of whether the ends are exposed when installed (to facilitate relocation).
   4. Drill cabinet sides to receive 5 mm intrinsic shelf rest.
   5. Sub-base: 4" high, attached to each base cabinet individually, covered in matching plastic laminate. Hold base 2" back from the cabinet front and 1/2" on each side.
   6. Bottoms of wall cabinets to receive matching plastic laminate.
   7. All cabinets with glass doors have exposed interiors to receive matching plastic laminate, including shelves and inside of doors.
   8. Door and drawer edge: Molded 3 mm PVC edges to match plastic laminate color.

D. Shelving
   1. Adjustable shelves to be 3/4" core (Standard) or 1" core (Heavy Duty), depending on shelf loading. See drawings for shelf thickness.
   2. Edge shelves to match 1 mm PVC to match plastic laminate color all (4) edges unless noted otherwise.
   3. Hardwood edge alternate: 1/8" x 3/4" hardwood edge band to standard shelf.

E. Countertops
   1. All countertops to be 1" core unless noted otherwise.
   2. Provide 4" backsplash at all countertops in wet areas (see project drawings).
   3. Countertops for office environment do not have a backsplash.
   4. Provide front edging as noted on drawings.
      a. 3mm PVC front edge unless indicated otherwise.
      b. Vinyl bullnose edge: 1" black bumper molding standard, #303-100 Bk by Outwater Plastics Industries, Inc., 4 Passaic Street, Wood-Ridge, NJ 07075, (800) 543-3217. Color as indicated on Drawings selected from manufacturer's standard of brown, white, almond, of Dove Gray.

F. Adhesive: Type as recommended by laminate manufacturer and adhesive manufacturer for intended use.

2.06 FABRICATION OF CABINETWORK DOORS

A. Fabrication of Cabinetwork Doors: Trim square and factory-size to nominal size less approximately 1/16 inch in width and 1/8 inch in height (unless otherwise required) for final fitting.

B. Quality Grade: Except as otherwise specified herein, provide AWI Premium Grade.

C. Door Guarantee: Guarantee cabinetwork doors for three (3) years. Guarantee shall cover faulty workmanship, materials, de-lamination or splitting of veneers, or warp in excess of 1/4 inch. Replace doors complete including fitting, hanging, and finishing.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine substrate and conditions under which work is to be installed and report unsatisfactory conditions. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 FINISH CARPENTRY INSTALLATION

A. Install millwork and cabinet work and adjust door and drawer front gaps in accordance with AWI Premium Grade.

B. Install in neat and workmanlike manner, free from hammer or tool marks, open joints, or slivers.

C. Set plumb, level, square and true. Scribe to floors and walls as required. Miter corners, countersink nails, drill holes for nails in hardwood. Install work after building humidity is at acceptable level.

D. Cut holes for countertop sinks. Obtain templates from plumbing contractor. Plastic laminate top joints shall be straight, even, and tight using joint connectors.

E. Ensure that mechanical and electrical items affecting this section are properly placed, complete, and have been inspected by architect prior to commencement of installation.

F. Install trim with butt joints and use finishing nails for exposed work. Finished work shall be free of hammer marks or open joints.

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

H. Clean cabinetwork, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 61 16

SOLID SURFACE FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. The following horizontal and trim solid surface product types:
      a. Countertops.
      b. Back splashes
      c. Side splashes.
      d. Window Stools.

B. Related Sections
   1. 06 10 00 – Rough Carpentry.
   2. 06 20 00 – Finish Carpentry.
   3. 07 92 00 – Joint Sealants.
   4. 09 29 00 – Gypsum Drywall.

1.02 DEFINITION

A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.03 SUBMITTALS

A. Product data
   1. For each type of product indicated.

B. Shop drawings
   1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
      a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
      b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
      c. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in solid surface.

C. Samples
   1. For each type of product indicated.
      a. Submit minimum 6 inch by 6-inch sample in specified gloss.
      b. Cut sample and seam together for representation of inconspicuous seam.
      c. Indicate full range of color and pattern variation.
      d. Approved samples will be retained as a standard for Work.

D. Product certificates
   1. For each type of product, signed by product manufacturer.

E. Fabricator/installer qualifications
   1. Provide copy of certification number.

F. Manufacturer certificates
   1. Signed by manufacturers certifying that they comply with requirements.

1.04 QUALITY ASSURANCE

A. Qualifications
   1. Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Fabricator/installer qualifications
   1. Work of this Section shall be by a certified fabricator/installer, certified in writing by the manufacturer.

C. Applicable standards
   1. Standards of the following, as referenced herein:
      a. American National Standards Institute (ANSI).
      b. American Society for Testing and Materials (ASTM).
      c. National Electrical Manufacturers Association (NEMA).
   2. Fire test response characteristics
      a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
         1) Flame Spread Index: 25 or less.
         2) Smoke Developed Index: 450 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver no components to Site until areas are ready for installation.

B. Store components indoors prior to installation.

C. Handle materials to prevent damage to finished surfaces.
   1. Provide protective coverings to prevent physical damage or staining following installation for duration of Project.

1.06 WARRANTY

A. Provide manufacturer's warranty against defects in materials.
   1. Warranty shall provide material and labor to repair or replace defective materials.
   2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:
   1. Corian® surfaces from the DuPont company (basis of design).

2. Other manufacturers whose products comply with the requirements herein.

2.02 MATERIALS

A. Solid polymer components
   1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
   2. Superficial damage to a depth of 0.010 inch (0.25 mm) shall be repairable by sanding and/or polishing.

B. Thickness
   1. 1/2-inch minimum.

C. Edge treatment
   1. As indicated on the Drawings.

D. Performance characteristics:

Property	**Typical Result**	**Test**
Tensile Strength	6,000 psi	ASTM D638
Tensile Modulus	1.5 by 10^{-6} psi	ASTM D638
Tensile Elongation	0.4 percent min.	ASTM D638
Flexural Strength	10,000 psi	ASTM D790
Flexural Modulus	1.2 by 10^{-6} psi	ASTM D790
Hardness	>85	
Rockwell "M"	Scale	ASTM D785
56 Barcol Impressor		ASTM D2583
Thermal Expansion	3.02 by 10^{-5} in./in./ C	ASTM D696 (1.80 by 10^{-5} in./in./°F)
Gloss (60 degrees Gardner)	5 to 75 (matte—highly polished)	ANSI Z124
Light Resistance	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
Wear and Cleanability	Passes	ANSI Z124.3 and Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 and Z124.6
Fungus and Bacteria Resistance	Does not support microbial growth	ASTM G21 and G22
Boiling Water Resistance	No visible change	NEMA LD 3-2000 Method 3.5
High Temperature Resistance	No change	NEMA LD 3-2000 Method 3.6
Izod Impact (Notched Specimen)	0.28 ft.-lbs./in. of notch	ASTM D256 (Method A)
Ball Impact	No fracture 1/2-lb. ball:	NEMA LD 3-2000
Resistance: Sheets	1/4-inch slab 36-inch drop 1/2-inch slab 144-inch drop	Method 3.8
Weatherability	ΔE^*_{94}<5 in 1,000 hrs.	ASTM G155
Specific Gravity †	1.7	
Water Absorption	Long-term 0.4 percent (3/4 inch) 0.6 percent (1/2 inch)	ASTM D570

	0.8 percent (1/4 inch)	
Property	**Typical Result**	**Test**
Toxicity	99 (solid colors) 66 (patterned colors)	Pittsburgh Protocol Test ("LC50"Test)
Flammability	All colors (Class I and Class A)	ASTM E84, NFPA 255 and UL 723
Flame Spread Index	<25	
Smoke Developed Index	<25	

† Approximate weight per square foot: 1/2 inch (12.3 mm) thick material is 4.4 lbs.

Shapes meet or exceed the ANSI Z124.3 and ANSI Z124.6 standards for plastic sinks and lavatories.

NEMA results based on the NEMA LD 3-2000.

2.03 ACCESSORIES

A. Joint adhesive
   1. Manufacturer's standard 1- or 2-part adhesive kit to create inconspicuous, nonporous joints.

B. Sealant
   1. Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone, any type), UL-listed silicone sealant in colors matching components.

2.04 FACTORY FABRICATION

A. Shop assembly
   1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
   2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
      a. Reinforce with strip of solid polymer material, 2 inches wide.
   3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the Drawings.
   4. Rout and finish component edges with clean, sharp returns.
      a. Rout cutouts, radii, and contours to template.
      b. Smooth edges.
      c. Repair or reject defective and inaccurate work.

2.05 FINISHES

A. Select from the manufacturer's standard color chart.
   1. Colors:
      a. **SS-1**: Mystique 9200CS by Wilsonart at window stools.
      b. **SS-2**: Mink Concrete 9248SS by Wilsonart at countertops.

B. Finish
   1. Provide surfaces with a uniform finish.

a. Matte; gloss range of 5 to 20.
b. Semi-gloss; gloss range of 20 to 50.
c. Polished; gloss range of 50 to 80.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
   1. Provide product in the largest pieces available.
   2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
      a. Exposed joints/seams shall not be allowed.
   3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
   4. Cut and finish component edges with clean, sharp returns.
   5. Rout radii and contours to template.
   6. Anchor securely to base cabinets or other supports.
   7. Carefully dress joints smooth, remove surface scratches and clean entire surface.

3.03 REPAIR

A. Repair or replace damaged work which cannot be repaired to Architect's satisfaction.

3.04 CLEANING AND PROTECTION

A. Keep components clean during installation.

B. Remove adhesives, sealants, and other stains.

END OF SECTION

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SECTION 07 11 13

BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Cavity wall dampproofing.

B. Products installed, but not specified under this Section:
   1. Cavity Wall Insulation: Refer to Section 07 21 00.

C. Related Sections:
   1. 04 21 13 – Brick Masonry.
   2. 04 22 00 – Concrete Unit Masonry.
   3. 04 71 16 – Manufactured Masonry Units.
   4. 07 21 00 – Insulation.

1.02 SYSTEM DESCRIPTION

A. Dampproofing assembly consisting of dampproofing and rigid insulation as indicated.

1.03 SUBMITTALS

A. Comply with Section 01 33 00, unless otherwise indicated.

B. Product Data: Manufacturer's specifications and technical data, including the following:
   1. Detailed specification of construction and fabrication.
   2. Certified test reports indicating compliance with performance requirements specified herein, including VOC compliance and certification that products do not contain asbestos material.

C. Quality Control Submittals:
   1. Statement of qualifications for manufacturer and installer.
   2. Statement of compliance for regulatory requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Not less than 5 years of experience in the actual production of specified products.

B. Installer's Qualifications: Firm with 3 years experience in installation of systems similar in complexity to those required for this Project, plus the following:
   1. Acceptable to or licensed by manufacturer.
   2. Successfully completed not less than 5 comparable scale projects using this system.
   3. Regulatory Requirements: Comply with United States Clean Air Act of 1978, Maximum Volatile Organic Content (VOC), and the Maricopa County Bureau of Air Pollution Rules and Regulations, Rule 336.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Deliver products in original unopened packaging with legible manufacturer's identification.

B. Storage and Protection: Comply with manufacturer's recommendations.
   1. Store products in a cool, dry place, out of direct sunlight.
   2. Protect from the elements and from damage.
   3. Store at a temperature of not less than 40 degrees F.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Maintain ambient temperature above 40 degrees F during and 24 hours after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers and Products for Dampproofing:
   1. Sonneborn Building Products: Hydrocide Semi-Mastic 700B.
   2. W.R. Grace and Company.
   3. Celotex Corporation.
   4. Karnak Chemical Corporation: Karnak 83 Fibrated Spray-Solvent Semi-Mastic.
   5. Euclid Chemical Company.
   6. W.R. Meadows, Inc.: Sealmastic Solvent Type Semi-Mastic.
   7. TK Products, Division of Sierra Corporation: TK-Hydromax 2001 Dampproof Coating.

2.02 MATERIALS

A. Bituminous Dampproofing for Cavity Wall Applications (**DAMP-1**): Fiber-reinforced (non-asbestos) solvent-base, semi-mastic asphaltic coating design for sprayed application and conforming to the following:
   1. ASTM D1227, Type II, Class 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
   1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Surfaces shall be dry, sound, reasonably smooth, and free of projections
   1. Fill depressions, holes, and cracks with a material compatible with the dampproofing.

3.03 APPLICATION AT ABOVE GRADE CAVITY WALLS

A. Spray apply bituminous dampproofing where indicated as **DAMP-1** and on exterior face of interior wythe (within the cavity) of cavity walls.
   1. Installer shall protect adjacent areas and surfaces from overspray and shall promptly and completely remove any overspray on surfaces not scheduled to receive **DAMP-1**.

B. Expansion and Control Joints in Cavity Walls: On exterior face of interior wythe.
   1. Install joints before application of dampproofing.
   2. Prime substrate which is to receive flashing adhesive as recommended by adhesive manufacturer.
   3. Install continuous strip of neoprene flashing centered over joint. Roll into adhesive to ensure bond.
      a. Ensure that center portion of neoprene flashing over joint (1 inch from each side of joint center line) is not bonded. Do not stretch flashing over joint.
      b. Trowel flashing adhesive continuously along each edge of neoprene flashing to provide watertight seal.
   4. Terminate under horizontal waterproofing above.

END OF SECTION

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SECTION 07 21 00

INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Perimeter Insulation.
   2. Cavity Wall Insulation.
   3. Closed cell polyurethane spray foam insulation.
   4. Unfaced Fiberglass Batt Insulation.

B. Related Sections
   1. 03 40 00 – Hollow Core Precast Concrete Plank.
   2. 04 21 13 – Brick Masonry.
   3. 04 22 00 – Concrete Unit Masonry.
   4. 04 71 16 – Manufactured Masonry Units.
   5. 06 10 00 – Rough Carpentry.
   6. 09 29 00 – Gypsum Drywall.

1.02 SUBMITTALS

A. Certification: Insulation manufacturers approved if any adhesives to be used and their application procedure.

B. Literature: Manufacturer's data on all materials to be used.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver to Site in manufacturer's wrapping or individual sheets that clearly identify the manufacturer, contents, brand name, and R-value.

B. Storage: Store off the ground and protect against weather, condition, and damage.

C. Handling: Remove damaged materials from Site and protect board insulation from prolonged sunlight.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Surfaces shall be dry.

B. Temperatures shall meet adhesive recommendations.

PART 2 PRODUCTS

2.01 INSULATION

A. Perimeter insulation (**INSUL-1**)
   1. Approved Manufacturers
      a. Dow Building Solutions Styrofoam™ Square Edge.

b. Owens Corning Foamular® 400.
c. DiversiFoam™ Products CertiFoam 40.
d. Pactiv Building Products, GreenGuard Insulation Board (Type VI 40 PSI).
e. Or Approved Equal.

2. Characteristics:
a. ASTM C578-87, Type VI.
b. Size: 48-inches by 9- inches.
c. Thickness: 2-inches, unless otherwise indicated on the Drawings.
d. Edges: Square.
e. Rigid extruded polystyrene: 1.8 pcf typical (ASTM C303), 1.6 pcf minimum.
f. Compressive Strength: 40 psi typical (ASTM D1621).
g. Comply with ASTM C578, Type VI.

B. Cavity Wall Insulation (**INSUL-2**)
1. Approved Manufacturers:
a. Dow Building Solutions Styrofoam™ Cavitymate™.
b. Owens Corning Foamular® CW25.
c. DiversiFoam™ Products CertiFoam 25 SE.
d. Pactiv Building Products, GreenGuard Insulation Board (Type IV 25 PSI).
e. Or approved equal.

2. Characteristics
a. ASTM C578-87, Type 4.
b. Size: 16-inches by 96-inches.
c. Thickness: 2-inches, unless otherwise indicated on the Drawings.
d. Edges: Square.
e. Rigid extruded polystyrene: 1.8 pcf typical (ASTM C303), 1.6 pcf minimum.
f. Compressive Strength: 40 psi typical (ASTM D1621), 25 psi minimum.
g. 5-Year Aged R-Value at 40 Degrees F: 5.4 per inch (ASTM C518).
h. Water Vapor Transmission Rate: 0.8 perms (ASTM E96).

3. Joint Sealing Tape: Manufacturer's standard.

C. Closed Cell Polyurethane Spray Foam Insulation (**INSUL-3**)
1. Approved Manufacturers
a. Icynene – MD-C-200™
b. Johns Manville JM Corbond® 2.8
c. Carlisle – SealTite™ PRO
d. Of Approved Equal.

2. Characteristics:
a. ASTM C518 – Thermal Resistance.
b. Aged Thermal Resistance: 1.5 inches to 11.25 inches thickness, based on 4" aged 90 days @ 140º F, R = 6.0 (hr.ft.² -º F)/BTU per inch
c. ASTM E283 – Air permeability of core foam = <0.02 L/S-m² @ 75 Pa for 1 inch thickness
d. ASTM E96 (Desiccant Method): 0.9 Perms @ 1.5 inches
e. ASTM CI338 – No fungus growth.
f. ASTM E84 – Surface Burning Characteristics @ 4 inches:
1) Flame Spread ≤25
2) Smoke Development ≤450

D. Unfaced Fiber Glass Batt Insulation (**INSUL-4**)
1. Approved Manufacturers
a. Certainteed – Fiber Glass Building Insulation.

b. Owens Corning – Fiber Glass Thermal Batts.
c. Johns Manville – Formaldehyde-free™ Fiber Glass Insulation.
d. Or Approved Equal.

2. Characteristics:
   a. ASTM C665, Type 1, and ASTM E136 (unfaced fiberglass batts).
   b. Obtain the R-Value shown on the Drawings or an R-38 if none is shown.
   c. Width: To fit framing spacing, 24-inch maximum.

2.02 VAPOR BARRIER (**VB**)

A. FS L-P-375 translucent polyethylene film, Type 1, Class 1, 6 mils thick.

2.03 ATTACHMENTS

A. Adhesive
   1. H.B. Fuller - Max Bond or manufacturer approved materials for conditions encountered.

B. Mechanical Fasteners
   1. Galvanized roofing nails with 3/8-inch diameter heads.
   2. Crown Staples: 16-gauge galvanized 3/8-inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Rigid Board Insulation
   1. Verify that substrate is flat, dry, and free of honeycombs, fins, or foreign materials that will impede adhesive bond or damage.

B. Fibrous Insulation
   1. Examine areas scheduled to receive insulation to insure protection against inclement weather and other hazards, and work of preceding trades is complete.

C. Beginning installation means installer accepts conditions.

3.02 RIGID BOARD INSULATION INSTALLATION

A. General
   1. Tightly fit each board together and stagger joints.
   2. Adhesive Application:
      a. Apply adhesive to insulation in 1 1/2-inch diameter spheres on 12-inch centers.
      b. Press insulation in place using rocking action.
   3. Mechanical Anchors
      a. Use with wood framing.
      b. Fasteners shall be placed not less than 16-inches on center with a 1/2-inch penetration into substrate.
   4. Fit insulation tightly around penetrations.

B. Furred out walls shall be adhesive applied insulation.

C. Perimeter Insulation
   1. Adhesive applied.
   2. Remove insulation exposed above grade.

3.03 FIBROUS INSULATION

A. General
   1. Fit insulation snugly between framing.
   2. Maintain integrity of insulation over entire area to be insulated.
   3. Insulate small areas between closely spaced framing members.
   4. Carefully cut and fit insulation around pipes, conduits, and other obstructions.
   5. Where pipes or conduit are located in stud spaces, place insulation between exterior wall and pipe, compress insulation where necessary.
   6. Fit insulation in spaces between rough openings and door frames.
   7. Mechanically fasten insulation when friction fitting can not be accomplished.

3.04 VAPOR BARRIER

A. General
   1. Secure vapor barrier to the substrate with tape or a minimal number of staples.
   2. Place on the warm side of all exterior wall and roof fibrous insulation and as otherwise required by the Drawings.
   3. Patch and seal punctures, tears, or voids in the vapor barrier.
   4. All splices shall have a 6-inch minimum lap joint.

3.05 CLEAN UP

A. Remove and dispose of excess materials, litter, and debris.

B. Leave work areas in a clean condition.

END OF SECTION

SECTION 07 27 08

MECHANICALLY ATTACHED FLEXIBLE SHEET AIR BARRIERS (BUILDING WRAPS)

PART 1 GENERAL

1.01 SUMMARY

A. This section includes the following:
   1. Mechanically attached flexible sheet air barrier (building wraps) located in the non-accessible part of the wall.
   2. Materials to bridge and seal the following air leakage pathways and gaps:
      a. Connections of the walls to the roof air barrier.
      b. Openings and penetrations of window frames.
      c. Door frames.
      d. Piping, conduit, duct and similar penetrations.
      e. All other air leakage pathways in the building envelope.

B. Related Sections:
   1. 06 10 00 – Rough Carpentry.
   2. 07 54 23 – Thermoplastic-Polyolefin (TPO) Roofing.
   3. 07 62 00 – Sheet Metal Flashing and Trim.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. All Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid.

1.03 PERFORMANCE REQUIREMENTS

A. Material Performance: Provide air barrier materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.004 cfm/ft^2 @ 1.57 psf) when tested in accordance with ASTM E2178 (unmodified).

B. The water vapor permeance [Desiccant method, (Procedure A) and Water method (Procedure B)] shall be determined in accordance with ASTM E96 and shall be declared by the material manufacturer.

C. Assembly Performance: Provide a continuous air barrier in the form of an assembly that has an air leakage not to exceed 0.04 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.04 cfm/ft^2 @ 1.57 psf) when tested in accordance with ASTM E2357. The assembly shall accommodate movements of building materials by providing expansion and control joints as required. Expansion / control joints, changes in substrate and perimeter conditions shall have appropriate accessory materials at such locations.
   1. The air barrier assembly shall be capable of withstanding combined design wind, fan and stack pressures, both positive and negative on the envelope without damage or displacement, and shall transfer the load to the structure.

2. Materials of the air barrier assembly shall not displace adjacent materials in the assembly under full load.
3. The air barrier assembly shall be joined in an airtight and flexible manner to the air barrier materials of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations, creep, and anticipated seismic movement.

D. Connections to Adjacent Materials: Provide connections to prevent air leakage at the following locations:
1. Foundation and walls, including penetrations, ties and anchors.
2. Walls, windows, curtain walls, storefronts, louvers and doors.
3. Different assemblies and fixed openings within those assemblies.
4. Wall and roof connections.
5. Floors over unconditioned space.
6. Walls, floor and roof across construction, control and expansion joints.
7. Walls, floors and roof to utility, pipe and duct penetrations.
8. Seismic and expansion joints.
9. All other potential air leakage pathways in the building envelope.

1.04 SUBMITTALS

A. Quality Assurance Program: Submit evidence of current Contractor accreditation and Installer certification under the Air Barrier Association of America's (ABAA) Quality Assurance Program (QAP). Submit accreditation number of the Contractor and certification number(s) of the ABAA Certified Installer(s).

B. Product Data: Submit material Manufacturer's Product Data, material manufacturer's instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, Technical Data, and tested physical and performance properties.
1. Submit letter from primary air barrier material manufacturer indicating approval of materials that are proposed to be used that are not currently listed in the accessories section of this specification for that manufacturer's material.
2. Include statement from the primary air barrier material manufacturer that the materials used in their air barrier assembly which will be used to adhere to the underlying substrate are chemically compatible to the substrate material.

C. Samples: Submit clearly labeled samples, three (3) inch by four (4) inch [75 mm by 100 mm] minimum size of each material specified.

D. Shop Drawings of Mock-Up: Submit Shop Drawings of proposed mock-ups showing plans, elevations, large-scale details, and air barrier transitions and terminations.

E. Field Test Results of Mock-Up: Submit test results of air leakage test and water leakage test of mock-up in accordance with specified standards, including retesting if initial results are not satisfactory.

F. Shop Drawings: Submit Shop Drawings showing locations and extent of air barrier assemblies and details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated, how materials that cover the materials are secured with air-tight condition maintained, and

how miscellaneous penetrations such as conduits, pipes, electric boxes and similar items are sealed.
1. Include VOC content of each material, and applicable legal limit in the jurisdiction of the project.
2. Include statement that materials are compatible with adjacent materials proposed for use.

G. Compatibility: Submit letter from primary material manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use. Submit letter from primary material manufacturer stating that cleaning materials used during installation are chemically compatible with adjacent materials proposed for use.

H. Air Barrier Subcontractor Qualifications: Air barrier Subcontractor(s) shall be accredited at the time of bidding and during the complete installation period by the Air Barrier Association of America (ABAA) whose Installer(s) are certified in accordance with the site Quality Assurance Program used by ABAA.
1. Mechanically Attached Flexible Sheet Air Barrier Installers shall be certified by BPQI (Building Performance Quality Institute) for the ABAA Quality Assurance Program in accordance with the requirements outlined in the QAP program used by ABAA. Installers shall have their photo-identification air barrier certification cards in their possession and available on the project site, for inspection upon request.

I. Manufacturer: Obtain primary ABAA Evaluated Materials from a single ABAA Evaluated Manufacturer regularly engaged in manufacturing specified mechanically attached flexible sheet. Obtain secondary materials from a source acceptable to the primary materials manufacturer.

J. Accredited Laboratory Testing for Materials: Laboratory accredited by International Accreditation Service Inc. (IAS), American Association for Laboratory Accreditation (A2LA), or the Standards Council of Canada (SCC).

K. VOC Regulations: Provide products which comply with applicable regulations controlling the use of volatile organic compounds.

L. Field Quality Assurance: Implement the site Quality Assurance Program requirements used by ABAA. Cooperate with ABAA Auditors and any independent testing and inspection agencies engaged by the Owner. Do not cover the air barrier assembly until it has been inspected, tested and accepted.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with the material manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by Mechanically Attached Flexible Sheet Air Barrier Manufacturer. Protect stored materials from direct sunlight.

C. Handle materials in accordance with material manufacturer’s recommendations.

1.06 PROJECT CONDITIONS

A. Temperature: Install Mechanically Attached Flexible Sheet Air Barriers within range of ambient and substrate temperatures recommended by the primary air barrier manufacturer. Do not apply air barrier to a damp or wet substrate.

B. Field Conditions: Do not install air barrier in snow, rain, fog, or mist. Do not install air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the primary material manufacturer.

C. Sequencing. Do not install air barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building.

D. Compatibility. Do not allow mechanically attached flexible sheet air barriers to come in contact with chemically incompatible materials.

E. Ultra-violet exposure. Do not expose air barrier materials to sunlight longer than as recommended by the primary material manufacturer.

1.07 WARRANTY

A. Material Warranty: Provide primary material manufacturer's standard product warranty, for a minimum three (3) years from date of Substantial Completion.

B. Subcontractor (approved by ABAA and manufacturer) Installation Warranty: Provide a two (2) year installation warranty from date of Substantial Completion, including all accessories and materials of the air barrier assembly, against failures including loss of airtight seal, loss of watertight seal and loss of attachment.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS

A. Mechanically Attached Flexible Sheet Air Barriers: Air Barrier. Subject to compliance with requirements, provide one of the following:
   1. Material: DuPont™ Tyvek® Commercial Wrap® D by DuPont Weatherization Systems: www.tyvek.com
      a. AIR BARRIER MATERIAL PROPERTIES:
         1) Air permeance for this material has been tested and reported as being 0.00045 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.00045 cfm/ft^2 @ 1.57 psf), when tested in accordance with ASTM E2178 (unmodified).
         2) The water vapor permeance for this material has been tested and reported as being 2437 nanograms per second per square meter divided by the pascals of vapor pressure per meter [42.7 US Perms] when tested in accordance with ASTM E96 (desiccant method - unmodified).
         3) The water vapor permeance for this material has been tested and reported as being 2427 nanograms per second per square meter divided by the pascals of vapor pressure per meter [42.5 US Perms] when tested in accordance with ASTM E96 (water method - unmodified).
      b. AIR BARRIER ACCESSORY MATERIALS:
         1) Sealing Tape: DuPont™ Tyvek® 3 inch Tape.

2) Fasteners: Wood Frame Construction: DuPont™ Tyvek® Wrap Caps, #4 nails with 1 inch plastic cap, 1 inch plastic cap staple with leg length sufficient to achieve 5/8 inch penetration.
3) Fasteners: For Masonry Construction Tapcon® fasteners with 2 inch plastic caps.
4) Flashing: DuPont™ FlexWrap™, DuPont™ FlexWrap™ NF, DuPont™ StraightFlash™, DuPont™ StraightFlash™ VF, Thru-Wall Flashing.
5) Caulks and Sealants: DuPont™ Commercial Sealant or DuPont recommended sealant, DuPont™ Window and Door Foam.

2. Material: GreenGuard MAX™ Building Wrap by Kingspan Insulation Limited: www.trustgreenguard.com
   a. AIR BARRIER MATERIAL PROPERTIES:
      1) Air permeance for this material has been tested and reported as being less than 0.0002 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (< 0.0002 cfm/ft^2 @ 1.57 psf) when tested in accordance with ASTM E2178 (unmodified).
      2) The water vapor permeance for this material has been tested and reported as being 773 nanograms per second per square meter divided by the pascals of vapor pressure per meter [13.52 US perms] when tested in accordance with ASTM E96 (desiccant method - unmodified).
   b. AIR BARRIER ACCESSORY MATERIALS:
      1) Fasteners (Wood Framing): 1 in. (25 mm) galvanized or corrosion-resistant nails with 1 3/4 in. (44 mm) GreenGuard® Caps or gasketed metal washers.
      2) Fasteners (Masonry): 1 3/4 in. (44 mm) Tap Con masonry fasteners with 1 3/4 in. (44 mm) GreenGuard® Caps or gasketed metal washers.
      3) Seam Tape: 3 in. (75 mm) GreenGuard® Contractor Tape or equivalent seam tape approved by Pactiv.
      4) Self-Adhering Flashing: GreenGuard® Butyl Flashing in widths of 4 in. (102 mm), 6 in. (152 mm), 9 in. (229 mm) and/or GreenGuard SuperStretch Butyl Flashing in widths of 7 in. (178 mm), 9 in. (229 mm) or equivalent self-adhering flashing approved by Pactiv.
      5) Sealant: Use adhesives and sealants as recommended in Pactiv's Technical Bulletin TB-011.

PART 3 EXECUTION

3.01 EXAMINATION

A. The ABAA Certified Air Barrier Contractor shall examine substrates, areas, and conditions under which the air barrier assembly will be installed, with General Contractor, ABAA Certified Installer present, for compliance with the following requirements.
   1. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
   2. Verify substrate is visibly dry.
   3. Ensure that the following conditions are met:
      a. Surfaces are sound, dry, even, and free of excess mortar or other contaminants.
      b. Inspect surfaces to be smooth without large voids or sharp protrusions. Inform General Contractor if substrates are not acceptable and need to be repaired by the concrete sub-trade.
      c. Inspect masonry joints to be reasonably flush and completely filled, and ensure all excess mortar sitting on masonry ties has been removed. Inform General

Contractor if masonry joints are not acceptable and need to be repaired by the mason sub-trade.

4. Verify sealants are compatible with flexible sheet air barrier proposed for use.
5. Notify Architect in writing of anticipated problems installing the air barrier material over substrate prior to proceeding.

3.02 INSTALLATION

A. Installation instructions for Mechanically Attached Flexible Sheet Air Barrier: Install flexible sheet air barrier in a way that provides continuity throughout the building envelope. Install materials in accordance with manufacturer's instructions and the following (unless manufacturer requires other procedures in writing based on project conditions or particular requirements of their recommended materials):
   1. Install the head flashing material over all doors and windows which will be later covered by the air barrier material for proper drainage of water away from the window.
   2. Install building wrap over masonry, backup sheathing board, rigid insulation or other fully supported continuous substrates as per manufacturer's instructions.
   3. Begin by aligning the bottom edge of the roll approximately 4 inches [100 mm] below the base of the wall onto the foundation, approximately 24 inches [610 mm] from a corner, with the print side facing out. Fold greater than 4 inches [100 mm] of material under itself and fasten securely to a stud, structural sheathing or through insulation board to an underlying framing member.
   4. Ensure air barrier material is plum and level on foundation, and unroll extending over window and door openings.
   5. Ensure air barrier material is applied over back edge of weep screed for proper water drainage.
   6. Unroll the air barrier material with the printed side facing out, wrapping the entire building, including door and window openings.
   7. Attach into wood stud framing, through sheathing board with plastic cap nails or fasteners specified by air barrier material manufacturer. The fasteners must penetrate the framing member a minimum of 1/2 inch [12 mm] on every vertical stud line.
   8. When attaching to masonry, use adhesive or other method of fastening as instructed by the air barrier material manufacturer.
   9. Fasteners need to be installed along every stud vertically and 12 inch [300 mm] or closer together as specified by the material manufacturer apart horizontally to maintain integrity of air barrier assembly to ensure the material is fastened to building when negative and positive pressures are exerted.
   10. Install with drainage plane surface pattern in horizontal position. Install lower-level air barrier material ensuring the upper layers of air barrier material lap the bottom layer to ensure proper shingling and water drainage.
   11. Overlap at all corners of building by a minimum of 12 inches [300 mm].
   12. Overlap vertical seams by a minimum of 6 inches [150 mm].
   13. Prepare each window and door rough opening as recommended by the air barrier manufacturer or prepare by cutting a modified “I” pattern and wrap excess material to the inside of the rough opening and fasten securely to a framing member. At the window header, make a 6 to 8 inch [150 – 200 mm] diagonal cut at the corners of the air barrier and fold the material up above the rough opening, exposing the underlying sheathing. If windows are already in place when installing air barriers, trim as close to them as possible and tape all edges with manufacturer approved sealant tape. Use of window flashing materials is required as described in the International Building Code.

14. Detail remaining terminations and penetrations with accessory materials as per manufacturer's instructions for air leakage and ensuring lapping of the material for proper shingling and drainage of bulk water.
15. When the end of a roll is reached, fold the edge of the building wrap under itself and attach to the structural sheathing or through non-structural sheathing to the nearest framing member.
16. Tape all horizontal and vertical seams with manufacturer approved construction tape.
17. Seal top and bottom edges of rolled out material to substrate with manufacturer approved construction tape.
18. Seal all tears and cuts with manufacturer approved construction tape.

3.03 FIELD QUALITY CONTROL

A. Owner's Inspection and Testing: Cooperate with Owner's testing agency. Allow access to work areas and staging. Notify Owner's testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted.

3.04 PROTECTING AND CLEANING

A. Protect air barrier materials from damage during installation and the remainder of the construction period, according to primary material manufacturer's written instructions.
   1. Coordinate with installation of materials which cover the air barrier assemblies, to ensure exposure period does not exceed that recommended by the air barrier material manufacturer.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION

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SECTION 07 42 46

ALUMINUM FACED COMPOSITE PANEL SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Aluminum faced composite wall panels.
   2. Panel system requirements include the following components:
      a. Aluminum faced composite panels with mounting system. Panel mounting system including anchorages, shims, furring, fasteners, gaskets and sealants, related flashing adapters, and masking (as required) for a complete watertight installation.
      b. Parapet coping, border, and filler items indicated as integral components of the panel system or as designed.

B. Related Sections
   1. 05 40 00 – Cold Formed Metal Framing.
   2. 06 10 00 – Rough Carpentry.
   3. 07 21 00 – Insulation.
   4. 07 62 00 – Sheet Metal Flashing and Trim.
   5. 07 92 00 – Joint Sealants.
   6. 08 11 16 – Aluminum Doors and Frames.
   7. 08 51 13 – Aluminum Windows.

1.02 QUALITY ASSURANCE

A. Composite Panel Manufacturer shall have a minimum of 5 years' experience in the manufacturing of this product.

B. Composite Panel Manufacturer shall be solely responsible for panel manufacture and application of the finish.

C. Fabricator/installer shall be acceptable to the composite panel manufacturer.

D. Fabricator/Installer shall have a minimum 5 years' experience of metal panel work similar in scope and size to this project.

E. Field measurements should be taken prior to the completion of shop fabrication whenever possible. However, coordinate fabrication schedule with construction progress as directed by the Contractor to avoid delay of work. Field fabrication may be allowed to ensure proper fit. However, field fabrication shall be kept to an absolute minimum with the majority of the fabrication being done under controlled shop conditions.

F. Shop drawings shall show the preferred joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on the inside face of the panel system as determined by ASTM E 331. Systems not utilizing a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated System) shall provide a means of concealed drainage with baffles and weeps for water which may accumulate in members of the system.

G. Maximum deviation from vertical and horizontal alignment of erected panels: 6mm (1/4") in 6m (20') non-accumulative.

H. Panel fabricator/installer shall assume undivided responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.

I. Composite panel manufacturer shall have established a Certification Program acceptable to the local Code Authorities.

1.03 REFERENCES

A. Aluminum Association
   1. AA-C22-A41: Anodized - Clear Coatings.
   2. AA-C22-A42: Anodized - Integral Color Coatings.

B. American Architectural Manufacturers Association
   1. AAMA 508-05: Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems

C. American Society for Testing and Materials
   1. E 330 Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads
   2. E 283 Rate of Leakage through Exterior Windows, Curtain Walls, and Doors
   3. D 1781 Climbing Drum Peel Test for Adhesives
   4. E 84 Surface Burning Characteristics of Building Materials
   5. D 3363 Method for Film Hardness by Pencil Test
   6. D 2794 Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
   7. D 3359 Methods for Measuring Adhesion by Tape Test
   8. D 2247 Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
   9. B 117 Method of Salt Spray (Fog) Testing
   10. D 822 Practice for Operating Light and Water Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products
   11. D 1308 Effect of Household Chemicals on Clear and Pigmented Organic Finishes
   12. D 1735 Method for Water Fog Testing of Organic Coatings.
   13. D 1929 Standard Test Method for Determining Ignition Temperature of Plastics
   14. D 635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

1.04 SUBMITTALS

A. Submittals shall be in conformance with Section 01 33 00 – Submittal Procedures.

B. Samples
   1. Panel System Assembly: Two samples of each type of assembly. 304mm (12") x 304mm (12") minimum.
   2. Two samples of each color or finish selected, 76mm (3") x 102mm (4") minimum.

C. Shop Drawings
   1. Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants, and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.

D. Affidavit certifying material meets requirements specified.

E. Two copies of manufacturer's literature for panel material.

F. Code Compliance:
   1. Documents showing product compliance with the national and local building code shall be submitted prior to the bid. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product.

G. Alternate materials must be approved by the architect prior to the bid date.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect finish and edges in accordance with panel manufacturer's recommendations.

B. Store material in accordance with panel manufacturer's recommendations.

1.06 WARRANTY

A. Warranty on Panel Material: Manufacturer's standard form in which manufacturer agrees to replace panels that fails within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 PANELS

A. Aluminum Faced Composite Panels
   1. ALUCOBOND material manufactured by 3A Composites USA, Inc. 208 West 5th Street, Benton, KY 42025 (800-626-3365 or 270-527-4200)
   2. Items of the same function and performance, which have received prior approval from the architect, shall be allowed for this project. Approval shall be based on documentation submitted showing the adequacy of the material.

B. Thickness: 6mm (0.236")

C. Product Performance
   1. Bond Integrity
      a. When tested for bond integrity, in accordance with ASTM D1781 (simulating resistance to panel delamination), there shall be no adhesive failure of the bond a) between the core and the skin nor b) cohesive failure of the core itself below the following values:

         Peel Strength: 115 N mm/mm (22.5 in lb/in) as manufactured
         115 N mm/mm (22.5 in lb/in) after 21 days soaking in water at 70°F
   2. Fire Performance

a. ASTM E 84 Flame Spread Index must be less than 25, Smoke Developed Index must be less than 450.
b. ASTM D 1929A self-ignition temperature of 650°F or greater.
c. ASTM D-635 Requires a CC1 classification.

D. Finishes
1. Coil coated KYNAR® 500 or HYLAR® 5000 based Polyvinylidene Fluoride (PVDF) or Fluoro Ethylene – Alkyl Vinyl Ether (FEVE) resin in conformance with the following general requirements of AAMA 2605.
a. Colors:
1) Color No. 1 **(MP1)**: Custom color to match Sherwin Williams Rhombus SW4051.
2) Color No. 2 **(MP2)**: Custom color to match Sherwin Williams Argent SW4052.
3) Color No. 3 **(MP3)**: Custom color to match Sherwin Williams Cool Blue SW4053.
4) Color No. 4 **(MP4)**: Custom color to match Sherwin Williams Basin SW4054.
b. Coating Thickness:
1) Colors: 1.0 mil (±0.2 mil).
c. Hardness: ASTM D-3363; HB minimum using Eagle Turquoise Pencil.
d. Impact:
1) Test method: ASTM D-2794; Gardner Variable Impact Tester with 5/8" mandrel.
2) Coating shall withstand reverse impact of 1.5"/pounds per mil substrate thickness.
3) Coating shall adhere tightly to metal when subjected to #600 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.
e. Adhesion:
1) Test Method: ASTM D-3359.
2) Coating shall not pick off when subjected to an 11" x 11" x 1/16" grid and taped with #600 Scotch Tape.
f. Humidity Resistance
1) Test Method: ASTM D-2247.
2) No formation of blisters when subject to condensing water fog at 100% relative humidity and 100°F for 4000 hours.
g. Salt Spray Resistance:
1) Test Method: ASTM B-117; Expose coating system to 4000 hours, using 5% NaCl solution.
2) Corrosion creepage from scribe line: 1/16" max.
3) Minimum blister rating of 8 within the test specimen field.
h. Weather Exposure
1) Outdoor:
a) Ten-year exposure at 45° angle facing south Florida exposure.
b) Maximum color change of 5 Delta E units as calculated in accordance with ASTM D-2244.
c) Maximum chalk rating of 8 in accordance with ASTM D-4214.
d) No checking, crazing, adhesion loss.
i. Chemical Resistance:
1) ASTM D-1308 utilizing 10% Muriatic Acid for an exposure time of 15 minutes. No loss of film adhesion or visual change when viewed by the unaided eye.
2) ASTM D-1308 utilizing 20% Sulfuric Acid for an exposure time of 18 hours. No loss of film adhesion or visual change when viewed by the unaided eye.
3) AAMA 2605 utilizing 70% reagent grade Nitric Acid vapor for an exposure time of 30 minutes. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D-2244.

2.02 PANEL FABRICATION

A. Composition:
   1. Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

B. Aluminum Face Sheets:
   1. Thickness: 0.50mm (0.0197") (nominal)
   2. Alloy: AA3000 Series (Painted material)

C. Panel Weight:
   1. 6mm (0.236"): 1.59 lbs./ft²

D. Tolerances
   1. Panel Bow: Maximum 0.8% of any 1828mm (72") panel dimension.
   2. Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.
   3. Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.
   4. Maximum deviation from panel flatness shall be 1/8" in 5'0" on panel in any direction for assembled units. (Non-accumulative - No Oil Canning)

E. System Characteristics
   1. Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers, receiving prior approval, may be acceptable, provided their details and characteristics comply with size and profile requirements, and material/performance standards.
   2. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
   3. System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.
   4. Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 70°F.
   5. Fabricate panel system so that no restraints can be placed on the panel, which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature change and at all times remain air and water tight.
   6. The finish side of the panel shall have a removable plastic film applied prior to fabrication, which shall remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

F. System Type
   1. Rout and Return Dry:
      System must provide a perimeter aluminum extrusion with integral weather-stripping as detailed on drawings.
   2. No field sealant required in joints unless specifically noted on drawings.

G. System Performance
   1. Composite panels shall be capable of withstanding building movements and weather exposures based on the following test standards required by the Architect and/or the local building code.
      a. Wind Load
         1) If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third-party laboratory, which show compliance to the following minimum standards:
         2) Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 20 pounds per square foot (psf) and 30 psf on parapet and corner panels. Wind load testing shall be conducted in accordance with ASTM E330 to obtain the following results.
         3) Normal to the plane of the wall between supports, deflection of the secured perimeter-framing members shall not exceed L/175 or 3/4", whichever is less.
         4) Normal to the plane of the wall, the maximum panel deflection shall not exceed L/60 of the full span.
         5) Maximum anchor deflection shall not exceed 1/16".
         6) At 1-1/2 times design pressure, permanent deflections of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1/16".
      b. Air/Water System Test
         1) If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory, which show compliance to the following minimum standards:
         2) Air Infiltration - When tested in accordance with ASTM E283, air infiltration at 1.57 psf must not exceed 0.06 cfm/ft² of wall area.
         3) Water Infiltration - Water infiltration is defined as uncontrolled water leakage through the exterior face of the assembly. Systems not using a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated Systems) shall be designed to drain any water leakage occurring at the joints. No water infiltration shall occur in any system under a differential static pressure of 6.24 psf after 15 minutes of exposure in accordance with ASTM E331.

2.03 ACCESSORIES

A. Attachment Assembly Components: Formed from extruded aluminum.

B. Extrusions, formed members, sheet, and plate shall conform with ASTM B209 and the recommendations of the manufacturer.

C. Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.

D. Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet performance requirements.

E. Fabricate flashing materials from 0.030" minimum thickness aluminum sheet painted to match the adjacent curtain wall / panel system where exposed. Provide a lap strap under

the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.

F. Fasteners (concealed/non-corrosive): Fasteners as recommended by panel manufacturer. Do not expose fasteners except where unavoidable and then match finish of adjoining metal.

2.04 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide Fabricator's standard sections as required for support and alignment of ALUMINUM FACED COMPOSITE panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of ALUMINUM FACED COMPOSITE panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as aluminum faced composite panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent aluminum faced composite panels.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND®; 3A Composites USA Inc.; ALUCOBOND® Axcent™ Trim or comparable product by one of the following:
      a. Arconic Architectural Products (USA).
      b. Mitsubishi Chemical Composites.
      c. Or approved equal.
   2. Aluminum Trim: Formed with 0.040-inch (1.00-mm-) thick, coil-coated aluminum sheet facings.
   3. Color: As indicated on drawing schedule.
      a. Color 1: <Insert color>.
      b. Color 2: <Insert color>.
      c. Color 3: <Insert color>.
      d. Color 4: <Insert color>.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of aluminum faced composite panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in ALUMINUM FACED COMPOSITE panels and remain weathertight; and as recommended in writing by aluminum faced composite panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, ALUMINUM FACED COMPOSITE panel supports, and other conditions affecting performance of the Work.
   1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by ALUMINUM FACED COMPOSITE wall panel manufacturer.
   2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by ALUMINUM FACED COMPOSITE wall panel manufacturer.
      a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and assemblies penetrating ALUMINUM FACED COMPOSITE panels to verify actual locations of penetrations relative to seam locations of ALUMINUM FACED COMPOSITE panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and ALUMINUM FACED COMPOSITE panel manufacturer's written recommendations.

3.03 INSTALLATION

A. Erect panels plumb, level, and true.

B. Attachment system shall allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -20°F to +180°F. Buckling of panels, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement will not be permitted. Fabrication, assembly, and erection procedure shall account for the ambient temperature at the time of the respective operation.

C. Panels shall be erected in accordance with an approved set of shop drawings.

D. Anchor panels securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.

E. Conform to panel fabricator's instructions for installation of concealed fasteners.

F. Do not install component parts that are observed to be defective, including warped, bowed, dented, abraised, and broken members.

G. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement with new parts.

H. Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

3.04 ADJUSTING AND CLEANING

A. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the General Contractor.

B. Repair panels with minor damage.

C. Remove masking (if used) as soon as possible after installation. Masking intentionally left in place after panel installation on an elevation, shall become the responsibility of the General Contractor.

D. Any additional protection, after installation, shall be the responsibility of the General Contractor.

E. Make sure weep holes and drainage channels are unobstructed and free of dirt and sealants.

F. Final cleaning shall not be part of the work of this section.

END OF SECTION

SECTION 07 54 23

THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Removal of entire existing roof membrane and flashings.
   2. Removal of all existing insulation down to the deck.
   3. Preparation of roofing substrates.
   4. Adhered membrane roofing system at roof areas with precast concrete roof planks, including cover board, roof insulation, and vapor barrier.
   5. Mechanically fastened membrane roofing system at roof areas with metal roof decking, including cover board, roof insulation, and vapor barrier.
   6. Wood nailers for roofing attachment.
   7. Insulation.
   8. Cover boards.
   9. Vapor retarder / air barrier.
   10. Elastomeric membrane roofing.
   11. Metal roof edging and copings.
   12. Flashings.
   13. Walkway pads.
   14. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.

B. Related Sections
   1. 03 40 00 – Hollow Core Precast Concrete Planks.
   2. 06 10 00 – Rough Carpentry.
   3. 07 62 00 – Sheet Metal Flashing and Trim.
   4. 07 72 00 – Roof Accessories.
   5. 07 92 00 – Joint Sealants.

1.02 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 “Terminology Relating to Roofing and Waterproofing”; glossary of NRCA's "The NRCA Roofing and Waterproofing Manual"; and the Roof Consultants Institute “Glossary of Roofing Terms” for definition of terms related to roofing work in this Section.

B. Sheet Metal Terminology and Techniques: SMACNA Architectural Sheet Metal Manual.

1.03 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with 1 another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Jobsite Safety: Execute all operations and provide a safe work environment in accordance with OSHA standards and regulations. This requirement applies to all contractor personnel, associated subcontractors, workers in other trades, and jobsite visitors.
   1. Follow all industry fire prevention guidelines for storage of materials, staging areas, roof access, and application means and methods.
   2. Any applicable local fire codes supersede industry guidelines.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
   1. Flashings and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Insulation fastening patterns.
   4. Sheet layout with perimeter and corner defined.

C. Samples for Verification: For the following products:
   1. Manufacturer's standard sample size of sheet roofing, of color specified, including T-shaped side and end lap seam.
   2. Manufacturer's standard sample size of walkway pads or rolls.
   3. Manufacturer's standard sample size of roof insulation.
   4. Manufacturer's standard sample size of metal termination bars.
   5. Six fasteners or each type, length and finish used for complete roofing installation.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
   1. Submit evidence of meeting performance requirements.

F. Qualification Data: For Installer and manufacturer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

H. Research/Evaluation Reports: For components of membrane roofing system.

I. Maintenance Data: For roofing system to include in maintenance manuals.

J. Warranties: Special warranties specified in this Section.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has UL listing for membrane roofing system identical to that used for this Project.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain all components from single source roofing manufacturer.

E. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
   1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
   2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.

F. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Comply with requirements for pre-installation conferences in Section 01 31 00 – Project Management and Coordination. Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:
   1. Meet with Owner, Architect, Owner's insurer if applicable, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Require that all complimentary trades be present at conference. Including, but not limited to; electrical, plumbing, HVAC, and framing contractors.
   7. Review Flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
   8. Review governing regulations and requirements for insurance and certificates if applicable.
   9. Review temporary protection requirements for roofing system during and after installation.
   10. Review roof observation and repair procedures after roofing installation.

G. Pre-Installation Conference: Conduct conference at Project site. Comply with requirements in Section 01 31 00. Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review Flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.07 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.08 WARRANTY

A. Provide manufacturer's system guarantee equal to Johns Manville's Peak Advantage No Dollar Limit Roofing System Guarantee.
   1. Single-Source special warranty includes roofing membrane, flashings, roofing membrane accessories, roof insulation, fasteners, cover board, vapor retarder, walkway products, and other single-source components of roofing system marketed by the manufacturer.
   2. Warranty Period: 20-years from date of Substantial Completion.

B. Installer's Guarantee: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of roofing system such as roofing membrane, Flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
   1. Warranty Period: 2-years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Basis of Design: Johns Manville Roofing Systems
   1. Other Acceptable Manufacturers:
      a. GAF: EverGuard® 60 mil TPO Adhered Membrane.
      b. Versico: VersiWeld® 60 mil Adhered TPO.
      c. Mule-Hide Products Co., Inc.: Mule-Hide TPO-c Membrane 60 mil (Fully Adhered).
      d. Firestone Building Products: UltraPly™ TPO Membrane 60 mil fully adhered.
      e. Carlisle Syntec Systems: Sure-Weld TPO Reinforced Membrane 60 mil fully adhered.
      f. Or approved equal.

2.02 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE (**SPR-1**)

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced.
   1. Thickness: 60 mils (1.5 mm), nominal.

2.03 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
   1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's sheet flashing of same material, type, reinforcement, thickness, and color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard solvent-based bonding adhesive for membrane, and solvent-based bonding adhesive for Flashings.

D. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, with anchors.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

2.04 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads sourced from membrane roofing system manufacturer.

2.05 COVER BOARD

A. 1/2-inch high-density polyisocyanurate (ASTM C 1289, Type II, Class 4, Grade 1, High-density Polyisocyanurate technology bonded in-line to inorganic coated glass facers with greater than 80 lbs of compressive strength) or 1/2-inch gypsum board, ASTM C 1177, with coated glass-mat facer and water-resistant gypsum substrate.

2.06 ROOF INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II.
   1. Provide insulation package with an R Value not less than 31 and an overall thickness of not less than 5-inches.
   2. Provide insulation package with 5 1/2-inch minimum thickness, including cover board.
   3. Install no boards thicker than 2-inches. If insulation package required is thicker than 2-inches, install in multiple layers.

2.07 TAPERED INSULATION

A. Tapered Insulation: ASTM C 1289, provide factory-tapered insulation boards fabricated to slope of 1/8 inch per 12 inches, unless otherwise indicated.

2.08 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Provide factory preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

C. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and provided by roofing system manufacturer.

D. Wood Nailer Strips: Comply with requirements in Section 06 10 00.

2.09 VAPOR BARRIER

A. Self-adhering roofing membrane designed for use with approved single-ply roof systems.
   1. Minimum thickness: 0.082 inches.

2.10 METAL ACCESSORIES

A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.
   1. Wind Performance:
      a. Membrane Pull-Off Resistance: 100 lb/ft (1460 N/m), minimum, when tested in accordance with ANSI/SPRI ES-1 Test Method RE-1, current edition.

b. Fascia Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-2, current edition.
c. Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-270 rating.

2. Fascia Face Height: 5 inches (127 mm).
3. Edge Member Height Above Nailer: 1-1/4 inches (31 mm).
4. Fascia Material and Finish: 22-gauge, 0.024 inch (0.06 mm) galvanized steel with Kynar 500 finish in manufacturer's standard color; matching concealed joint splice plates; factory-installed protective plastic film. Color as selected by Owner.
5. Length: 144 inches (3650 mm).
6. Functional Characteristics: Fascia retainer supports while allowing for free thermal cycling of fascia.
7. Aluminum Bar: Continuous 6063-T6 alloy aluminum extrusion with pre-punched slotted holes; miters welded; injection molded EPDM splices to allow thermal expansion.
8. Anchor Bar Cleat: 20-gauge, 0.036-inch (0.9 mm) G90 coated commercial type galvanized steel with pre-punched holes.
9. Curved Applications: Factory modified.
10. Fasteners: Factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners permitted.
11. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, scuppers, and end caps; minimum 14 inch (355 mm) long legs on corner pieces.
12. Scuppers: Welded watertight.
13. Accessories: Provide matching brick wall cap, downspout, extenders, and other special fabrications as shown on the drawings.

B. Parapet Copings: Formed metal coping with galvanized steel anchor/support cleats for capping any parapet wall; watertight, maintenance free, without exposed fasteners; butt type joints with concealed splice plates; mechanically fastened as indicated; Elevate PTCF.
1. Wind Performance:
a. At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-3, current edition.
b. Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-90 rating.
2. Description: Coping sections allowed to expand and contract freely while locked in place on anchor cleats by mechanical pressure from hardened stainless steel springs factory attached to anchor cleats; 8 inch (200 mm) wide splice plates with factory applied dual non-curing sealant strips capable of providing watertight seal.
3. Material and Finish: 22-gauge, 0.024 inch (0.06 mm) thick galvanized steel with Kynar 500 finish in manufacturer's standard color; matching concealed joint splice plates; factory-installed protective plastic film. Color as selected by Owner.
4. Dimensions:
a. Wall Width: As indicated on the drawings.
b. Piece Length: Minimum 144 inches (3650 mm).
c. Curved Application: Factory fabricated in true radius.
5. Anchor/Support Cleats: 20-gauge, 0.036 inch (0.9 mm) thick prepunched galvanized cleat with 12 inch (305 mm) wide stainless-steel spring mechanically locked to cleat at 72 inches (1820 mm) on center.
6. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, corners, intersections, curves, pier caps, and

end caps; minimum 14 inch (355 mm) long legs on corner, intersection, and end pieces.
7. Fasteners: Factory-furnished; electrolytically compatible; minimum pull out resistance of 240 pounds (109 kg) for actual substrate used; no exposed fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
   1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
   2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 VAPOR BARRIER INSTALLATION

A. Install modified bituminous vapor retarder sheet per roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
   1. Adhere vapor retarder in a full mopping of hot asphalt to substrate per roofing system manufacturer’s written instructions.
   2. Self-adhere vapor retarder to substrate per roofing system manufacturer’s instructions.

B. Completely seal vapor barrier at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.04 INSULATION INSTALLATION

A. Coordinate installing roof system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4-inch (6 mm) with insulation.
   1. Cut and fit insulation within 1/4-inch (6 mm) of nailers, projections, and penetrations.

E. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 1.5-inches (38 mm) or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6-inches (150 mm) in each direction.

F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

H. Adhered Insulation: Adhere each layer of insulation to substrate as follows:
   1. Install each layer in a two-part urethane adhesive according to roofing system manufacturer's instruction.
   2. Install each layer to resist uplift pressure at corners, perimeter, and field of roof.

I. Proceed with installation only after unsatisfactory conditions have been corrected.

3.05 COVER BOARD INSTALLATION

A. Coordinate installing membrane roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.

C. Install cover board with long joints of cover board in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4-inch (6 mm) with cover board.
   1. Cut and fit cover board within 1/4-inch (6 mm) of nailers, projections, and penetrations.

D. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
   1. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

E. Adhered Cover Board: Adhere cover board to substrate as follows:
   1. Install in a two-part urethane adhesive according to roofing system manufacturer's instruction.
   2. Install to resist uplift pressure at corners, perimeter, and field of roof.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.06 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply solvent-based bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

D. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

E. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
   2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
      a. Remove and repair any unsatisfactory sections before proceeding with Work.
   3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.

G. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.07 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   1. Follow roofing manufacturer's instructions.
   2. Remove protective plastic surface film immediately before installation.
   3. Install water block sealant under the membrane anchorage leg.
   4. Flash with manufacturers recommended flashing sheet unless otherwise indicated.
   5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
   6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.

7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.

C. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.
   1. Use the longest practical flashing pieces.
   2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
   3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
   4. Provide termination directly to the vertical substrate as shown on roof drawings.

D. Roof Drains:
   1. Existing Drains: Remove all existing flashings, drain leads, roofing materials and cement from the drain; remove clamping ring.
   2. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
   3. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch (12 to 19 mm) of membrane to extend inside clamping ring past drain bolts.
   4. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
   5. Apply sealant on top of drain bowl where clamping ring seats below the membrane.
   6. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.

E. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
   1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
   2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches (50 mm) deep, with at least 1 inch (25 mm) clearance from penetration, sloped to shed water.
   3. Structural Steel Tubing: If corner radii are greater than 1/4 inch (6 mm) and longest side of tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.
   4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.

3.08 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.09 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

B. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Sheet metal flashing and trim.

B. Related Sections
   1. 06 10 00 – Rough Carpentry.
   2. 07 54 23 – Thermoplastic Polyolefin (TPO) Roofing.
   3. 07 72 00 – Roof Accessories.

1.02 QUALITY ASSURANCE

A. Install flashing according to standards of the National Roofing Contractors Association (NRCA).

B. References on the Drawings to NRCA details refer to "The NRCA Construction Details," published by the NRCA.

C. Sheet Metal and Air Conditioning Contractors National Association, Inc. - Architectural Sheet Metal Manual (SMACNA).

1.03 SUBMITTALS

A. Shop Drawings: Show size and configuration of all items.

B. Literature: Manufacturer's data and samples of standard color selection.

1.04 WARRANTY

A. Guarantee materials and workmanship for 2 years as being watertight.

B. Guarantee against color fade for 20 years.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Peterson Aluminum Corporation: PAC-CLAD.

B. Firestone Building Products Company, LLC: UNA-CLAD.

C. Berridge Industries, Inc.

D. Or approved equal.

2.02 MATERIALS

A. Steel Panels: ASTM A653, 22-gauge, G90 (lock-forming quality), extra smooth, tension-leveled, galvanized steel, minimum spangle.
   1. Thickness: 22-gauge.
   2. Exposed Coil-Coated Finishes
      a. 2 Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70-percent PVDF resin by weight in both color coat and clear topcoat.
      b. Color: As selected by Architect from manufacturer's full range of standard colors.

2.03 MECHANICAL FASTENERS

A. All mechanical fasteners shall be of non-corroding material. All exposed fasteners shall match color of adjacent finished materials.

2.04 SEALANTS

A. Metal manufacturer's recommended elastomeric sealant or mastic. Exposed sealant color shall match metal color.

2.05 FABRICATIONS

A. Drip Edge and Fascia
   1. Provide complete drip edge and fascia system, including riveted mitered corners, field-applied sealant, neoprene spacers, concealed splice plates, and hold-down cleats.
   2. System shall conform to dimensions shown on the Drawings.

B. Metal Coping System
   1. Provide complete cap flashing system, including riveted mitered corners, field-applied sealant, neoprene spacers, concealed 6-inch wide splice plates of same gauge and color as cap flashing, and continuous galvanized hook strips.
   2. System shall conform to dimensions shown on the Drawings.
   3. Blocking to support metal coping system shall be fire-treated wood.

C. Gutters
   1. Shop-fabricated from 22-gauge prefinished galvanized sheet metal.
   2. Design: Profile as shown on the Drawings with 20-gauge straps at 3'-0" on center maximum.
   3. Fabrication of gutter, joints, end caps, outlet tubes shall meet SMACNA requirements.

D. Downspout
   1. Shop-fabricated from 22-gauge prefinished galvanized sheet metal.
   2. Straps and anchors of matching material 10 feet on center maximum.
   3. Fasteners: As required.
   4. Style: SMACNA Figure F (open faced).
   5. Size: 4 inches by 6 inches.
   6. End Condition: Flare out at 45-degree angle at 8-inches above grade.

E. Pipe Flashing
   1. Flashing at other than hot pipes shall be molded boot furnished and installed. Boots shall be compatible with roofing system and approved by roofing system manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all materials in accordance with the manufacturer's recommendations to provide a watertight installation.

B. Shop fabricate and install using recognized sheet metal processes.

C. Leave a 1/2-inch joint between abutting parts for expansion at metal coping system.

D. Seal all metal penetrations, including reglets, cover plates with sealant or mastic.

E. Seal along joint between flashing and wall or roofing materials.

END OF SECTION

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SECTION 07 72 00

ROOF ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Roof scuttles.

B. Related Sections
   1. 06 10 00 – Rough Carpentry.
   2. 07 54 23 – Thermoplastic-Polyolefin (TPO) Roofing.
   3. 07 62 00 – Sheet Metal Flashing and Trim.
   4. 07 92 00 – Joint Sealants.

1.02 SUBMITTALS

A. Submittals and shop drawings in accordance with Section 01 33 00.
   1. Shop drawings required showing size and configuration of roof scuttle and flashing details.

1.03 QUALITY ASSURANCE

A. Manufacturer shall guarantee against defects in material and workmanship for 5 years.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Bilco Company:
   1. RS-1: Type NB.

B. Babcock Davis:
   1. RS-1: BRHTA30X54S1T.

C. Or Approved Equal.

2.02 ROOF SCUTTLE

A. Sizes
   1. **RS-1**: 2 feet – 6 inches by 4 feet – 6 inches, single leaf door.

B. Construction
   1. Cover: 11-gauge aluminum with 3-inch beaded flange with formed reinforcing members. Cover shall have a heavy extruded thermoplastic rubber gasket fitted into a retainer that is mechanically fastened to the cover interior to assure a continuous seal when compressed to the top surface of the curb.
   2. Cover Insulation: 1 inch glass fiber fully covered by 18-gauge aluminum cover liner.

3. Curb
    a. Shall be 12 inches high and of 11-gauge aluminum. The curb shall be formed with a 3-1/2 inch flange with 7/16 inch holes provided for securing to the roof deck. The curb shall be equipped with an integral metal cap flashing of the same gauge and material as the curb, fully welded at each corner that features the Posi-Flash flashing system, including stamped tabs 6 inches on center to be bent inward to hold roof counterflashing system securely in place.
4. Curb Insulation: Shall be rigid, high-density fiberboard of 1 inch thickness on outside of curb.
5. Lifting Mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.
6. Hardware
    a. Heavy pintle hinges shall be provided.
    b. Cover shall be equipped with an enclosed 2-point spring latch with interior and exterior turn handles.
    c. Roof scuttle shall be equipped with interior padlock hasp.
    d. The latch strike shall be a stamped component bolted to the curb assembly.
    e. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1-inch diameter red vinyl grip handle to permit easy release for closing.
    f. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be Type 316 stainless steel. Springs shall have an electro-coated acrylic finish for corrosion resistance.
    g. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.
7. Finishes: Roof scuttle shall be finished to match adjacent roof covering color.

C. Liner Extension: Provide 20-gauge mill finish aluminum panels to cover treated wood blocking at scuttle curb and extend downward to cover edges of precast concrete roof planks and/or opening support framing. Provide 1 inch return at top of panels to insert between roof scuttle curb and treated wood blocking at top and provide hemmed edge with 3 inch return at bottom of precast concrete roof planks. Provide mitered corners and overlaps as necessary.

D. Sealants: 1-part acrylic terpolymer base type “mono” conforming to ASTM C834.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install according to manufacturer’s instructions.

B. Coordinate installation with Roofing Contractor.

C. Seal base of roof scuttle flashing.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Firestopping not specified elsewhere.

B. Related Sections
   1. 07 92 00 – Joint Sealants.
   2. 09 29 00 – Gypsum Drywall.
   3. 22 07 00 – Plumbing Insulation.
   4. 23 07 00 – HVAC Insulation.
   5. 26 05 05 – Basic Electrical Materials and Methods.

1.02 DEFINITIONS

A. Firestopping: A material or combination of materials to retain the integrity of time-rated construction by maintaining an effective barrier against the spread of flame, smoke, and gases. It shall be used in specific locations as follows:
   1. Duct, cables, conduit, and piping penetrations through floor slab and through time-rated partitions or fire walls.
   2. Penetrations of vertical service shafts.
   3. Openings and penetrations in time-rated partitions or fire walls containing fire doors.
   4. Locations where shown on the Drawings or specified in other Sections of the Specifications.

1.03 QUALITY ASSURANCE

A. Submit manufacturer's product data, letter of certification or certified laboratory test that the material or combination of materials meet the requirements specified in ASTM E814 and are so classified in UL's Building Materials Directory.

B. Materials shall meet and be acceptable for use by the state building code.

C. Materials shall meet the requirements of NFPA 101-Life Safety Code and NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit shop drawings, product data, certifications for each condition requiring firestopping, and manufacturer's installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver in original unopened containers or packaging bearing manufacturer's names, brand designations, and product descriptions.

B. Store materials under cover and protected from damage.

C. Do not use damaged materials.

D. Provide proper ventilation if using solvents.

E. Keep flammable materials away from sparks and flames.

F. Use safety glasses and protective clothing.

G. Comply with manufacturer's temperature requirements.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. 3M - Electrical Products Division.

B. DOW Corning Fire Stop System.

C. Standard Oil - Fyre Putty.

D. Or Approved Equal.

2.02 FIRESTOPPING MATERIALS

A. Firestopping materials/constructions shall constitute 1 or more of the following by 3M Brand, or approved equal:
   1. Caulk: CP-25.
   2. Putty: 303.
   3. Wrap/Strip: FS-195.
   4. Composite Sheet: CS-195.
   5. Penetrating Sealing System: 7900 Series.
   6. Compatible materials with those above as certified by the manufacturer.

B. Firestopping materials shall be asbestos-free and capable of maintaining an effective barrier against flame, smoke, and gases in compliance with the requirements of ASTM E814 and UL 1479.

C. Materials shall be compatible with surrounding materials.

D. On insulated pipe, the fire-rating classification must not require removal of the insulation.

E. The rating of the firestops shall be at least 1 hour, but in no case less than the rating of the time-rated floor or wall assembly.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to be in contact with firestopping materials free of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting or the required fire resistance.

3.02 INSTALLATION

A. Install firestopping materials indicated in accordance with manufacturer's instructions.

B. Seal all holes or voids made by penetrations to ensure an effective smoke barrier.

C. Unless protected from possible loading or traffic, install firestopping materials in floors having void openings of 4 inches or more to support the same floor load requirements.

D. Fill all holes, penetrations, and sleeves in all fire-rated assemblies, unless included in other Sections of the Specifications.

3.03 FIELD QUALITY CONTROL

A. Examine firestopping areas to ensure proper installation prior to concealing or enclosing firestopped areas.

B. Areas of work shall remain accessible until inspection by the applicable code authorities.

3.04 ADJUSTING AND CLEANING

A. Clean up spilled products.

B. Cut and trim cured foam with sharp knife.

C. Remove equipment, materials, and debris leaving area in undamaged, clean condition.

END OF SECTION

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SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Exterior and interior sealants.

B. Related Sections
   1. 03 45 13 – Architectural Precast Concrete Specialties.
   2. 04 21 13 – Brick Masonry.
   3. 04 22 00 – Concrete Unit Masonry.
   4. 04 71 16 – Manufactured Masonry Units.
   5. 08 11 00 – Metal Doors and Frames.
   6. 08 11 16 – Aluminum Doors and Frames.
   7. 08 51 13 – Aluminum Windows.
   8. 08 91 19 – Metal Wall Louvers.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

1.03 SUBMITTALS

A. Shop Drawings Consistent with Section 01 33 00 and Including:
   1. Two 6-inch long bead of each color of caulking to be used.
   2. Two 6-inch pieces of each size of backing material to be used.
   3. Copies of manufacturer's specifications, recommendations, and installation instructions for caulking, backer rod, and accessory materials.
   4. Manufacturer's published data, letter of certification, or certified test laboratory report that each material complies with requirements and is intended for application shown.

1.04 QUALITY ASSURANCE

A. Applicator Qualification: Minimum 2 years of experience in applying sealants and approved by sealant manufacturer.

B. Mock-Up
   1. Prepare sample application in location directed by Architect.
   2. Approval of the mock-up must be obtained from Architect.
   3. Accepted mock-up shall constitute standard of acceptance for remaining Work.

1.05 PRODUCT HANDLING

A. Deliver materials in original, tightly sealed containers or unopened packages with manufacturer's name, labels, product identification, and lot numbers where appropriate.

B. Store materials out of weather in original containers or unopened packages as recommended by manufacturer.

1.06 JOB CONDITIONS

A. The compounds shall be applied within an air temperature range of 40 degrees F to 80 degrees F to clean and dry substrate, unless manufacturer's literature and procedure allows for an exception.

1.07 WARRANTY

A. Provide caulking manufacturers standard 10-year material guarantee.

B. Guarantee workmanship against leakage for 2 years.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Tremco, Dymeric, Sikaflex-2C NS/SL, or approved equal - General Applications.

B. Mameco Vulkem 116 One-Part High Performance Elastomer - Submersion Service.

C. Fire Barrier Caulk: 3M Brand.

D. Or Approved Equal.

E. Colors: To be selected by Architect from manufacturer's standard colors. Colors may be different for every type of material receiving caulk.

2.02 MATERIAL

A. Sealant Materials
   1. Vertical Surfaces
      a. For Interior Joints Up to 2 Inches Wide: 1-part acrylic terpolymer base type "Mono" conforming to ASTM C834.
      b. For Exterior Joints and Joints Larger Than 2 Inches Wide: 2-parts polytremdyne base type "Dymeric" conforming to ASTM C920.
      c. Caulking Compound for All Interior Joints Not Subject to Movement: Acrylic type which does not contain ingredients that will stain masonry or corrode metals conforming to ASTM C834.

2.03 BACKER ROD

A. Material: Closed cell polyethylene ethafoam, or approved equal, compatible with sealant. Sof-rod by applied extrusion technology will be accepted for horizontal locations.

B. Sized and shaped to control depth of sealant and to provide 20-percent to 50-percent compression upon insertion.

2.04 MISCELLANEOUS MATERIALS

A. Joint Cleaner: Caulking manufacturer's recommended cleaner for condition encountered.

B. Primer: Manufacturer's recommended primer for various substation substrates encountered.

C. Bond Breaker: Pressure sensitive adhesive polyethylene tape.

D. Masking Tape: Pressure sensitive adhesive paper tape.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine joints to be caulked for construction defects which would adversely affect execution of Work.

B. Do not start Work until conditions are satisfactory and construction defects have been corrected.

3.02 PREPARATION

A. Wire brush, grind, sandblast, solvent wash, or prime per manufacturer's recommendations any surface containing release agents, water proofing, dust, loose mortar or laitance, paint or finishes.

B. Cleaning: Clean joint surfaces using joint cleaner as necessary to be free of dust, dirt, oil, grease, rust, lacquers, laitance, release agents, moisture, or other matter which might adversely affect adhesion of caulking.

C. Masking: Mask areas adjacent to joints.

D. Priming: Apply primer following manufacturer's instructions.

3.03 APPLICATION

A. Install backer rod material in new and existing joints using blunt instrument to avoid puncturing. Do not twist backer rod while installing. Install backer rod so that joint depth is 50 percent of joint width, but a minimum of 1/4 inch deep.

B. Apply caulking in new joints using pressure gun with nozzle cut to fit joint width. Make sure caulking is deposited in uniform, continuous beads without gaps or air pockets.

C. Tool joints to required configuration within 10 minutes of caulking application. If masking materials are used, remove immediately after tooling.

D. Verify sealant type as required in other Sections.

E. Apply sealant as shown on the Drawings and on new or modified areas as follows:
   1. Perimeter of new sound attenuated partitions.
   2. Around the bottom of all interior door frames where metal abuts or contacts concrete.

3. Around openings in walls, ceilings, and floors at conduits, pipes, ducts, and similar items (both sides of walls, ceiling, and floors). Apply Fire Barrier caulk at all such penetrations through rated walls.
4. All areas where dissimilar wall materials abut or adjoin.
5. Any other places shown on the Drawings.

F. Caulking is not to be painted.

3.04 CLEANING

A. Remove excess materials adjacent to joints by mechanical means or with xylol (xylene) or mineral spirits as work progresses to eliminate evidence of spillage or damage to adjacent surfaces. Note: When using flammable solvents, avoid heat, sparks, and open flames. Always provide adequate ventilation and follow all precautions listed on solvent container label.

B. Leave finished work in neat, clean condition with no evidence of spillovers onto adjacent surfaces.

END OF SECTION

SECTION 08 11 00

METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Hollow metal doors and frames.

B. Related Sections
   1. 04 22 00 – Concrete Unit Masonry.
   2. 07 92 00 – Joint Sealants.
   3. 08 70 00 – Finish Hardware.
   4. 08 81 00 – Glazing.
   5. 09 29 00 – Gypsum Drywall.
   6. 09 91 00 – Painting.

1.02 SUBMITTALS

A. Manufacturer's descriptive literature and installation instructions.

B. Shop Drawings: Illustrations and schedule of door and frame sizes, types, materials, construction, finishing, anchoring, accessories, and preparation for installing hardware.

1.03 QUALITY ASSURANCE

A. Erector shall have minimum of 2 years' experience installing stock hollow metal work.

B. Regulatory Agency Requirements
   1. Must comply with applicable Minnesota State Building Code requirements.

C. Manufacturer shall be a NAAMM member and shall comply with Standard Steel Door and Frame ANSI/SDI 100 (latest edition) Specifications.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver all products in cartons and palletized.

B. Inspect products upon delivery for damage.

C. Store products under cover and on wood blocks.

D. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

E. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

F. Provide 1/4-inch space between stacked doors.

PART 2 PRODUCTS

2.01 HOLLOW METAL FRAMES

A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 (ZF180) metallic coating.
   1. Bullet Resistant (**BR**) Door Frames: 12-gauge UL752 Level 3 bullet resistance.
   2. Door Frames: 14-gauge.

B. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.
   1. Closer Reinforcements: Fabricate according to ANSI/SDI A250.6 with half sleeve closer reinforcement plates welded to frame minimum 14-gauge.
   2. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at top hinge locations.
   3. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.

C. Wall Anchors
   1. Masonry: "T" Strap Type to suit frame size, formed from A60 metallic coated material, not less than 0.042-inch-thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long Provide minimum 5 anchors per jamb. [Hinge Jamb: 1 anchor just below top hinge, anchors just above and below each hinge. Strike Jamb: Just above and below strike location, other space evenly above and below strike location.
   2. Stud Wall Type: At Steel stud applications, Spot weld 16-gauge provide minimum 5 anchors per jamb. [Hinge Jamb: 1 anchor just below top hinge, anchors just above and below each hinge. Strike Jamb: Just above and below strike location, other space evenly above and below strike location. Spot welding shall not be visible through frame.

D. Floor Anchors
   1. Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

E. Accessories
   1. Silencers: 3 required on stop jamb of single swing frames, 2 required on head of frame for pair of swing doors.

F. Bituminous Coating
   1. Factory or shop apply inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils.

G. Fabrication
   1. General: Fabricate frames with mitered or coped corners and continuously arc-welded for full depth and width of frame. Contact edges shall be closed tight and all welds on exposed surfaces dressed smooth and flush. Finished work shall be strong and rigid, neat in appearance, and free from defects.

2.02 HOLLOW METAL DOORS

A. Material: Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 (ZF180) metallic coating.
   1. Bullet Resistant (**BR**) Doors: 12-gauge UL752 Level 3 bullet resistance.
   2. Doors: Minimum 16-gauge steel with manufacturer's standard polyurethane. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value 2.17 or better.

B. Hardware Reinforcement
   1. General: Door shall be mortised, reinforced, and mortise hardware reinforcements drilled and tapped at factory for templated hardware, all in accordance with approved hardware schedule and templates provided by the hardware supplier. Where surface mounted hardware is to be applied, door shall have welded on reinforcing plates only; all drilling and tapping for surface-mounted hardware shall be a field operation by installation personnel.
   2. Reinforcement Gauges: Hinges - 3/16 inch by 1-1/4 inches by 9 inches. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
   3. Closer Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates minimum 14-gauge.

C. Bullet Resistant Doors
   1. Materials and construction of bullet resistant doors shall be as required to meet UL752 Level 3 bullet resistance.

D. Fire Rated Doors
   1. Materials and construction of fire rated doors shall be as required to meet Underwriters Laboratories, Inc., label classification for opening. Fire rated doors shall bear U/L label for class and rating required.

E. Fabrication
   1. General: Hollow metal doors shall be fully welded of types and sizes shown on Drawings, seamless construction with no visible seams or joints on faces or vertical edges. All doors shall be strong, rigid, and neat in appearance, free from warpage or buckle. All doors shall maintain a flatness tolerance of plus or minus 0.03 inch in a diagonal direction.
   2. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
   3. Construction: Construct doors and panels of cold-rolled steel face sheets. Top and bottom edges of doors shall be closed with a continuous recessed steel channel not less than 16 gauge, extending full width of door and spot-welded to both faces. Doors shall have an additional flush filler channel at top edges welded full width of door on both edges, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable. Seal joints in top edges of door against water penetration.
   4. Openings shall be provided in bottom closure of exterior doors to permit escape of entrapped moisture.
   5. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Coordinate with Section 08-8000 for glass types. Install glass as recommended by manufacturer and in compliance with ITS-Warnock Hersey or UL approved glazing system.

6. Astragals: Provide “Z” style overlapping astragals as required by hardware application in Section 08 71 00 – Door Hardware on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted. Flat bar astragals are not allowed.

2.03 SHOP PAINTING

A. Doors and frames to be cleaned, and chemically treated to ensure maximum finish paint adhesion. Surfaces of the door and frame exposed to view shall receive a factory applied coat of rust inhibiting shop primer.

B. Doors and frames shall be leveled and ground smooth.

C. Apply mineral filler to eliminate weld scars and other blemishes.

D. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

2.04 SEALANTS

A. Joint sealants shall be 1-part acrylic terpolymer based type “Mono” conforming to ASTM C834.

B. Color as selected by Architect from manufacturer’s standard colors.

PART 3 EXECUTION

3.01 INSPECTION

A. Frame Installer and Contractor are responsible to examine door frames two times after original installation for the following purposes:
   1. First after their initial installation of frames by Contractor and installation of walls boards or masonry units.
   2. Prior to installation of doors and hardware.

B. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
   1. Verify that frames are installed plumb, square and true and will maintain maximum and minimum gap requirements listed in NFPA 80-2010, NFPA 101-2012 before installation of doors and hardware as follows:
      a. Head, Jambs, and meeting edge of pairs gap requirements: 1/8 inch Maximum.
      b. 3/4 inch at sill Maximum.
   2. Any installed door frames that exceed the minimum or maximum gap requirements, such opening shall be removed and replaced without delay including all necessary products and processes to achieve the specified opening at no additional cost to the Owner.
   3. Examine floor and opening conditions to assure suitability for installation.

C. Provide Architect with written report listing conditions detrimental to compliance with requirements of this Section. Accepted installation constitutes acceptance of responsibility for performance.

D. Do not proceed with installation until dimensions and conditions of openings are satisfactory.

3.02 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
   1. Set frames accurately in position at finished floor level, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
   3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
   4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim, as necessary.
   1. Frames shall not deviate from the horizontal and vertical construction by any amount greater than:
      a. Top to Bottom: 1/4 inch over entire frame height.
      b. Jamb to Jamb: 1/8 inch over entire width of single leaf door frames.
      c. 1/4 inch over entire width of double leaf door frames.
   2. Doors shall not deviate from the horizontal and vertical planes of the frames in which they are installed by any amount greater than:
      a. Top to Bottom: 1/8 inch over entire door height.
      b. Jamb to Jamb (Back edge to front edge): 1/16 inch over width of door leaf.

D. Install all hardware as noted on the door schedule or listed in this Specification.

E. Any doors that are installed in door frames that exceed the minimum or maximum gap requirements, such opening shall be removed and replaced without delay including all necessary products and processes to achieve the specified opening at no additional cost to the Owner.

F. Sealant shall be applied where frames abut walls, apply neat even line.

3.03 ANCHORS

A. Use anchors as recommended by the manufacturer for the conditions encountered.

B. Anchors that pierce the frames shall be countersunk.

C. After the frame is properly positioned and tightly anchored, the countersunk anchors shall be covered with auto-body filling compound and sanded smooth.

D. When the filling compound has fully cured, the jambs shall be sanded smooth and immediately coated with primer to prevent absorption of moisture into the filling compound.

3.04 ADJUSTMENTS

A. Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Adjust all door closers to shut doors tight against jambs.

3.05 CLEANING

A. Remove dirt and excess sealants or glazing compound from exposed surfaces.

B. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer and/or finish paint.

C. Remove debris from Site.

END OF SECTION

SECTION 08 11 16

ALUMINUM DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Aluminum doors and frames.
   2. Install all hardware furnished by Section 08 71 00 – Door Hardware.

B. Related Sections
   1. 04 21 13 – Brick Masonry.
   2. 04 71 16 – Manufactured Masonry Units.
   3. 06 10 00 – Rough Carpentry.
   4. 07 92 00 – Joint Sealants.
   5. 08 71 00 – Door Hardware.
   6. 08 81 00 – Glazing.
   7. 09 29 00 – Gypsum Drywall.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:
   1. All Work and costs of this Section shall be incidental to the Project and be included in the Total Base Bid.

1.03 SUBMITTALS

A. Submittals and shop drawings in accordance with Section 01 33 00.

B. Product Data: Manufacturer's descriptive literature and installation instructions.

C. Shop Drawings: Illustrations and schedule of door and frame sizes, types, materials, construction, finishing, anchoring, accessories, and preparation for installing hardware.

D. Submit samples of the metal finish to show the range of color variation.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of providing aluminum framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.

C. Source Limitations: Obtain aluminum framed storefront system through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum framed storefront system and are based on the specific system indicated. Frame system shall be equal to EnCORE as manufactured by Kawneer (Standard of Quality).

E. Entire system shall be designed for 20 psf wind load and having a maximum deflection of L/175 of the span.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Kawneer, an Alcoa Company.

B. Cronstroms Mfg., Inc.

C. Tubelite Architectural Products.

D. Or Approved Equal.

2.02 MATERIALS

A. Extrusion shall be 6063-T5 Alloy and Temper (ASTM B221 Alloy G.S. 10A-T5). The thermal barrier shall consist of a 2 part, chemically curing, high-density polyurethane. Fasteners, where exposed, shall be aluminum, stainless steel, or zinc plated steel in accordance with ASTM A164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum. Single acting entrance frame weather stripping shall be a non-porous, polymeric material.

2.03 FINISH

A. Exposed grid framing members shall be free of scratches and other serious surface blemishes and shall receive an AAMA 611, Architectural Class I Color Anodic Coating (thickness not less than 0.7 mil).
   1. Color: Champagne ANO-300 AE.

2.04 CONSTRUCTION AND WORKMANSHIP

A. Fabrication
   1. Door stiles shall be fabricated of seamless hollow aluminum tubes. The wall thickness of door stiles shall not be less than 0.125 inch. Reinforcing for hardware anchorage shall consist of 1/8 inch steel bar and shall be anchored directly to the steel reinforcing. Steel tie rods of 3/8 inch diameter shall run full width of all top and bottom rails and fixed with stainless steel tension plates and lock nuts. On the leading edge of meeting stiles on pairs of doors, weatherstripping shall be inserted into a keyway type groove. This groove is to be an integral part of the basic extrusion and not an applied member. All 4 corners of doors shall be welded. Door frame wall thickness shall not be less than 0.125 inch and shall be the full height of frame. Reinforcing steel channels shall have a minimum thickness of 3/16 inch and butt hinges shall be anchored directly to the steel. Steel reinforcing shall have a zinc chromate coating.
   2. Glazing members on doors and frames shall be of such design that they are snapped in, eliminating the use of exposed screws. The minimum wall thickness shall not be less

than 0.05 inch. The glazing on both sides of glass shall receive a neoprene bead. Applied glazing members on exterior frames shall be factory sealed.

3. Hardware reinforcements on doors and frames shall be completely concealed and fastened in place without the attaching method being visible.
4. The framing system shall provide for a flush glazing appearance with no projecting stops. Vertical and horizontal framing members shall have a nominal dimension of 1-3/4 inches by 6 inches.

2.05 DOORS

A. Doors shall be medium stile sized as per the Door and Frame Schedule. Finish shall match the framing members.

2.06 HARDWARE

A. Hardware is as specified in Section 08 70 00. Some items supplied and installed by the aluminum door and frame supplier are door pivots and weatherstripping.

2.07 GLASS

A. Glass is specified and installed in Section 08 81 00.

2.08 CAULK

A. Caulk, as specified in Section 07 92 00.

PART 3 EXECUTION

3.01 INSPECTION

A. Assure that frame openings correspond to dimensions of frame furnished.

B. Check that surfaces to contact frame are free of debris.

C. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Coat aluminum with 2 coats of clear varnish where metal will touch concrete block or mortar to avoid corrosion.

B. Seal around edges of all frames and as required by the manufacturer. Sealant shall be smooth, even, and uniform.

3.03 TOLERANCES

A. Attach frames square, plumb and true to line with adjacent construction.

B. Installation of all doors shall meet the following tolerances:
1. Frames shall not deviate from the horizontal and vertical construction by any amount greater than:
a. Top to Bottom: $\pm$ 1/4 inch over entire frame height.

b. Jamb to Jamb: ± 1/8 inch over entire width of single leaf door frames. ± 1/4 inch over entire width of double leaf door frames.

2. Doors shall not deviate from the horizontal and vertical planes of the frames in which they are installed by any amount greater than:
   a. Top to Bottom: ± 1/8 inch over entire door height.
   b. Jamb to Jamb (Back Edge to Front Edge): ± 1/16 inch over width of door leaf.
3. Doors having double leaves shall meet tolerances of Paragraph 3.03.B.2. above and in addition, shall not deviate from the horizontal and vertical planes of the adjacent door leaf by any amount greater than:
   a. Horizontal Gap Between Leaves: 1/8 inch + 1/16 inch over entire height of door.
   b. Top (Horizontal) Edge of Adjacent Leaves: 1/16 inch.
   c. Vertical Edges and Faces of Adjacent Leaves: ± 1/8 inch over entire height of doors.

3.04 ADJUSTING

A. Adjust all doors to ensure ease of operation before leaving the Site. Adjust moving parts for smooth operation.

B. Adjust all door closers to shut tight against jambs.

3.05 CLEANING

A. Remove dirt and excess sealants or glazing compound from exposed surfaces.

B. Touch up marred or abraded surfaces to match original finish.

END OF SECTION

SECTION 08 36 13

UPWARD ACTING SECTIONAL DOORS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Upward Acting Sectional Doors.
   2. Operators and controls.

B. Related Sections
   1. 03 45 00 – Architectural Precast Wall Panels.
   2. 04 21 13 – Brick Masonry.
   3. 04 22 00 – Concrete Unit Masonry.
   4. 06 10 00 – Rough Carpentry.
   5. Division 26.

1.02 SUBMITTALS

A. Shop drawings required, including details of door, door track, and operator.

B. Manufacturers' descriptive literature and installation instructions.

C. Manufacturers' maintenance and operating instructions for the door and operator.

1.03 WARRANTY

A. 1-year limited warranty for all materials and installation.

B. Exterior and interior skins shall be warranted for 5 years against delamination from the insulation.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

The listed manufacturers shall meet or exceed the specification listed.

A. Raynor Manufacturing Co.: ThermaSeal TM220.

B. Overhead Door Corporation: Thermacore Door, 596 Series.

C. Wayne-Dalton Corporation: Thermospan Door, Model 200-20.

D. Industrial Door Co, Inc.: Model 3722.

2.02 EXTERIOR DOORS

A. Sections: 2-inch minimum thick with a roll-formed 20-gauge galvanized steel embossed with a textured pattern exterior skin, and a thermal break. All sections reinforced with backup plates and pre-punched for attachment of hardware.

B. Full glazed Aluminum Sash Panels.
   1. 1/2-inch tempered insulating glass.

C. End Stiles: 16-gauge minimum.

D. Insulation: CFC and HCFC Free insulation either polyurethane or polystyrene with a minimum overall R-value of 14.5.

E. Hinges and Fixtures: Heavy-duty commercial double ended and long stem roller galvanized steel hinges. 3-inch rollers with steel rims and case-hardened raceways and ball bearings.

F. Weather seals: Rubber tube seals fitted inside section joints. PVC bull type strip at bottom.

G. Wind Load: ANSI/ASMA 102 standards and as required by code.

H. Color: Exterior and Interior door panels shall be manufacturer's standard white 2-coat baked-on polyester finish.

2.03 TRACK AND ACCESSORIES

A. 3-inch wide galvanized steel lift clearance track, provide minimum of 2 braced supports per track.

B. All required hardware.

C. Weatherstrip: Manufacturers standard jamb and head.

D. Spring: 100,000 cycle life.

2.04 ELECTRIC DOOR OPERATORS

A. Electric Operator: Center mounted draw bar assembly, 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. Provide means to disengage motor to allow manual operation in event of power failure.

B. Motor shall be minimum 3/4 horsepower, 120volt, continuous duty with instant reverse and automatic reset thermal overload. Motor shall be UL listed.

C. Disconnect Switch: Factory mount disconnect switch on equipment.

D. Motor Type: NEMA MG1.

E. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated.

F. Control Station: Standard three button (open-close-stop) momentary pressure type, control for each electric operator; 24 volt circuit, surface mounted.

G. Remote door controls:
   1. Provide ten (10) 2-button remote control devices for each door.

H. Safety Edge: At bottom of door panel, full width; electro-mechanical sensitized type, wired to reverse door upon striking object; hollow neoprene covered to provide weatherstrip seal.

I. Photoelectric Sensor: Furnish system which detects obstruction and reverses door without requiring door to contact obstruction.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect substrate openings and structures for compliance and do not commence Work until everything is satisfactory.

3.02 INSTALLATION

A. Install per manufacturer's instructions and recommendations.

B. Install door straight, plumb, and level and in a weather tight manner.

C. Coordinate Work with other trades.

D. Operator's push button stations, leading edge shall be installed by the electrical contractor.

E. Electrical contractor to provide electricity to a box next to operator.

3.03 CLEANUP

A. Make final adjustments so doors are in good operating condition.

B. Touch up paint on any areas scratched or chipped during the installation.

C. Remove all debris at conclusion of installation.

END OF SECTION

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SECTION 08 39 54

BULLET RESISTANT FRAMING SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bullet resistant stainless-steel frame and glazing.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:
   1. All Work and costs of this Section shall be incidental to the Project and be included in the Total Base Bid.

1.03 REFERENCES

A. Underwriters Laboratory UL 752-Standard for Bullet Resisting Equipment.

B. ASTM A 666-Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate and Flat Bar.

C. ASTM A36/A36M-08 Standard Specification for Carbon Steel.

1.04 ACTION SUBMITTALS

A. Refer to Section 01 33 00 – Submittal Procedures.

B. Product Data: For each type of framing and glass including manufacturer recommended installation instructions.

C. Shop Drawings: Include plans, elevations, sections, details, and attachment to other work.

D. Samples: For each exposed finish.

1.05 INFORMATION SUBMITTALS

A. Product Test Reports: Indicating compliance with requirements.

B. Warranty: Sample of finish warranty.

1.06 CLOSEOUT SUBMITTALS

A. Refer to Section 01 78 23 – Operation and Maintenance Manuals.

B. Maintenance data.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site with the manufacturer's UL Listed Labels intact and legible. Handle the materials with care to prevent damage. Store materials inside and under cover, stack flat and off floor. Project conditions (temperature, humidity, and ventilation) shall be within the maximum limit recommendations provided by manufacturer. Do not install products stored in conditions outside manufacturer's recommended limits.

1.08 WARRANTY

A. Workmanship Warranty: All materials shall be warranted against defects for a period of 1 year from the date of project substantial completion. Provide certificates of manufacturer's standard limited warranty with closeout documents.

B. Finish Warranty: Manufacturer's warranty against deterioration of factory finishes for the period of 5 years from the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Basis of Design:
   1. Subject to compliance with requirements, provide products by the following:
      a. Total Security Solutions, Inc., 935 Garden Lane, Fowlerville, MI 48836, 866 734-6277. Attn: Sales Department, sales@tssbulletproof.com . Web: www.tssbulletproof.com.
   2. Subject to compliance with requirements, manufacturers of products of equivalent design may be acceptable if approved in accordance with 01 60 00 – Product Requirements.
      a. Armortex, 5926 Corridor Parkway, Schertz, TX 78154

B. Design Performance:
   1. Through the design, manufacturing techniques and material application the TSS Bullet Resistant Stainless-Steel Frame shall be of the non-ricochet type. This design is intended to permit the retention of an attacking projectile lessening the potential of a random injury or lateral penetration.
   2. All joints and connections shall be tight, providing hairline points and true alignment of adjacent members.

C. Frame Performance:
   1. Frame shall be manufactured to defeat ballistic assaults in accordance with UL Standard 752, Levels 1 through 5, and 8.

D. Frame Construction:
   1. Frame construction:
      a. 18 gauge commercial steel
   2. Frame finish:
      a. #4 stainless steel, finished in factory by manufacturer.
   3. Steel shall be free of scale, pitting, coil breaks or other surface defects.
   4. Frames shall be welded and ground flush.
   5. Standard tolerances shall be +/- 1/16 inch for frame opening width, height, and diagonal.

E. Glazing: Shall comply with UL 752, Level 1 through 8 and shall not be removable from threat side of sash.
   1. Bullet-Resisting Glazing Material:
      a. Bullet Resistant Level 3
         1) 1-1/4 inch LP 1250 Laminated.
   2. Design Performance
      a. Light Transmission in excess of 90 percent.

F. Field alterations to the construction of the assembly fabricated under the acceptable standards are not allowed unless approved in writing by the manufacturer and the Architect.

G. Standard manufacturing tolerances +/- 1/16 inch shall be maintained.

2.02 PERFORMANCE CRITERIA

A. Ballistic Resistant:
   1. Level 3 in accordance with UL 752 – Testing for Ballistic Resistance for the complete assembly including framing, glazing and panels.

2.03 ACCESSORIES

A. Anchors: Fully concealed manufacturer recommended.

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to beginning installation, verify that all supports have been installed as required by the Contract Documents and architectural drawings, and Shop Drawings have been approved.

B. Notify Architect of any unsatisfactory preparation that is responsibility of others.

C. Clean and prepare all surfaces per manufacturers recommendations as required for achieving the best results for the substrate under the project conditions.

D. Verify field dimensions of openings prior to fabrication of framing.

E. Coordinate structural requirements to ensure proper attachment and support.

F. Do not begin installation of material until all unsatisfactory conditions have been resolved and approved by Architect.

3.02 INSTALLATION

A. Do not begin installation until openings have been verified and surfaces properly prepared in accordance with Drawings.

B. Install in accordance with manufacturer's instructions and UL 752. Set all equipment plumb.

C. All products shall be installed per installation instructions provided by manufacturer.

D. Frame assembly shall arrive on site completely prefabricated to field dimensions approved by Shop Drawings.

E. Install framing and secure to structure in accordance with manufacturer's recommendations and approved shop drawings.

F. Provide required support and securely fasten and set frame plumb, square, and level without twist or bow.

G. Apply sealant in accordance with manufacturer's recommendations as indicated in installation instructions.

H. Remove excess sealant and leave exposed surfaces clean and smooth.

3.03 PROTECTION

A. Clean and protect frame assembly from damage during ongoing construction operations. If damage occurs, remove and replace as required to provide assembly in their original, undamaged condition.

B. Inspection and Cleaning: Verify installation is complete and complies with manufacturer's requirements.

C. Provide final cleaning of product and accessories, removing excess sealant, labels, and protective covers.

D. Touch-up, repair or replace damaged products prior to Substantial Completion.

END OF SECTION

SECTION 08 51 13

ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
1. Aluminum windows including perimeter trims, sill flashing with end dams, accessories, shims and anchors, and perimeter sealing of window units.
2. Types of aluminum windows
a. Fixed Windows: 2-piece low rise framing system with non-metallic thermal isolator designed to accept 1-inch glazing material.
1) Profiles: 1-3/4 inch wide by 6 inches deep.

B. Related Sections
1. 03 45 13 – Architectural Precast Concrete Specialties.
2. 04 21 13 – Brick Masonry.
3. 04 22 00 – Concrete Unit Masonry.
4. 04 71 16 – Manufactured Masonry Units.
5. 05 40 00 – Cold Formed Metal Framing.
6. 06 10 00 – Rough Carpentry.
7. 06 61 16 – Solid Surface Fabrications.
8. 07 92 00 – Joint Sealants.
9. 08 81 00 – Glazing.
10. 09 29 00 – Gypsum Drywall.

1.02 SUBMITTALS

A. Product Data
1. Submit manufacturer's product data, including description of materials, components, fabrication, finish, and installation.

B. Manufacturer’s specifications and technical data, including the following:
1. Detailed specification of construction and fabrication.
2. Manufacturer’s installation instructions.
3. Certified test reports clearly indicating compliance with performance requirements specified herein.
4. Glass warranty, including manufacturer’s written certification of compatibility between glazing material and hermetic seal.
5. Sealant manufacturer’s data on surface preparation and application for each type of sealant proposed.

C. Shop Drawings
1. Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware and installation procedures, plus the following specific requirements:
a. Elevate entire openings of framing system.
b. Indicate jamb, head, and sill conditions and specific anchorage details and spacing for each situation.

c. Large scale details of sills, weep system, meeting rail interlock, sash glazing.
d. Custom extrusions.
e. Glazing details.

D. Color Samples
1. 2 sets of samples for color selection of verification for the following:
a. Frame color and finish.

E. Quality Control Submittals
1. Statement of qualifications.
2. Test Reports and Design Data: Laboratory test reports and redlined design charts attached to letter from manufacturer indicating compliance with requirements specified herein.

1.03 QUALITY ASSURANCE

A. Installer's Qualifications
1. Acceptable to or licensed by manufacturer.

B. Product Qualifications
1. Fixed Units: Performance requirements as outlined in ANSI/AMA GA-001, except for special specified herein:
a. Air infiltration Tested at 6.24 PSF
1) Laboratory test data not to exceed 0.06 CFM/square foot.
2) Actual field tests not to exceed 0.09 CFM/square foot.
b. Water resistance tested at 8.0 PSF = No leakage.
c. Uniform Load Structural Rest
1) Maximum L/175 deflection at design load (30 PSF positive and negative).
2) No permanent set at 150 percent of design load (45 PSF positive and negative).

1.04 WARRANTY

A. Contractor/Manufacturer/Installer shall stand behind installed system for a period of 5 years from date of Substantial Completion against all the conditions indicated below and when notified in writing from the Owner, Contractor/Manufacturer/ Installer shall promptly and without inconvenience and cost to Owner correct said deficiencies.
1. Failure of hermetic seal.
2. Stress breakage resulting from improper framing design.
3. Breakage resulting from chipped or damaged edge conditions from original installation or thermal stresses.
4. Faulty material and workmanship.
5. Water and air infiltration in excess of performance requirements specified herein.
6. Sealant failure, both around perimeter and within window frame.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Acceptable Manufacturers and Products for the Exterior Window System:
1. Kawneer, an Alcoa Company
a. Fixed Windows: EnCORE®.
b. CMI Architectural Products, Inc.: CTS.
c. Tubelite, Inc.: VersaTherm™ Framing.

d. Or Approved Equal.

B. Clarification Note: Drawings and Installation Specifications are based on manufacturer's proprietary literature from Kawneer Company, Inc. Other specified manufacturers shall comply with the minimum levels of material and detailing indicated on the Drawings and specified herein.

2.02 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.090 inch (2.3 mm) wall thickness at any location for the main frame and sash members.
   1. Recycled Content: Shall have a minimum of 50 percent mixed pre- and post-consumer recycled content.

B. Thermal Barrier: High density, non-conductive material separating inside and outside portions of both frames and sash sections.
   1. Design to provide minimum Condensation Resistance Factor (CRF) specified herein.

C. Fasteners: Nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

D. Anchors: Nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

2.03 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.

2.04 CONSTRUCTION AND MATERIALS

A. Frames: Extrude members in single lengths with pour-in-place thermal barrier and wall thickness as determined by manufacturer to resist loads:
   1. Join corners using stainless steel fasteners and small joint epoxy adhesive/sealant to form a watertight hairline joint. Reinforce corner construction with aluminum gusset blocks and chemically weld in place.
   2. Field assembled corner units and field applied sealants within frame construction is not permitted.
   3. Design frames to allow for thermal expansion and contraction within frame construction. Provisions to allow for expansion within glazing material is not acceptable.

2.05 ACCESSORIES

A. Fasteners Within Frame Assembly: Series 300 stainless steel.

B. Perimeter Anchors: Aluminum, stainless steel, or other materials recommended by manufacturer and compatible with frame members, trim, hardware, and anchors.

C. Fasteners: Aluminum, stainless steel, or zinc plated steel complying with ASTM A164.

D. Glazing Gaskets: EPDM elastomeric extrusions specially designed for application.

E. Sealant Within Frame System: As recommended by manufacturer and specially designed for use in framing/window wall applications.

F. Sealant for Installation Around Frames: Provide under this Section in compliance with requirements specified under Section 07 92 00:
   1. Provide low-modulus silicone unless otherwise indicated.
   2. Verify compatibility with sealants used in adjacent construction.

G. Bituminous Coating: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil thickness per coat.

H. Glass Types: Provide under this Section in compliance with requirements specified under Section 08 81 00.

I. Glazing Gaskets: Resilient closed-cell sponge neoprene.

J. Weatherstrip Material: Extruded sponge neoprene complying with ASTM C509.

K. Weep Hole Filter Material: 6 inches long, 30 to 40 ppi open cell, reticulated, polyurethane foam block with PVC coating, sized to install at 30-percent to 50-percent compression.

L. Foam Insulation: Provide under this Section.

M. Anchors: Steel or aluminum size and configuration as determined by manufacturer for design loading and attachment requirements.

N. Slip Shim Pads: As recommended by frame manufacturer.

O. Fabric Flashing: 30-mil neoprene or EPDM.

2.06 FABRICATION

A. Fabricate frames allowing for minimum clearances and shim spacing around perimeter of assembly yet enabling installation.

B. Rigidly fit and weld joints and corners. Accurately fit and secure corners tight. Make corner joints flush, hairline, and weatherproof. Seal corner joints with sealant.

C. Develop drainage holes with moisture pattern to exterior.

D. Prepare components to receive anchor devices. Do not bridge thermal barrier with anchoring devices.

E. Provide internal reinforcement in mullions with galvanized steel members to maintain rigidity.

2.07 FACTORY FINISH

A. Anodic Coating: Clean exposed surfaces with caustic etch and anodize to an Architectural Class 1 coating:
   1. Color Anodic Coating: Clean exposed surfaces with medium matte caustic etch and anodize to an Architectural Class 1 coating (thickness not less than 0.7 mil).
      a. Color: Champagne ANO-300 AE.

B. Furnish manufacturer's matching touch-up anodic coating for touch-up of fasteners and abrasions.

C. Thoroughly clean, etch, and give metal surfaces a chromate conversion pretreatment before application of the primer coat.

D. Apply a heavy coating of bituminous paint where aluminum contacts masonry, concrete, mortar, plaster, or a dissimilar metal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed, and identify conditions detrimental to proper or timely completion:
   1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer's recommendations.

B. Erect frames plumb, true, and square in a substantial manner with concealed fasteners. Anchor securely without distortion of the frames.

C. Install sills and related aluminum trim. Set in bed of mastic.

D. Use anchorage devices to securely attach frame to structure.

E. Apply 1 coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar metal.

F. Align frame plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent work.

G. Coordinate attachment and seal of air and vapor barrier materials. Install flashings.

H. Fill perimeter voids in window frame channel with polyethylene backer material or foam insulation.

I. Inject sprayed foam insulation in shim spaces at perimeter to maintain continuity of thermal barrier.

J. Install Related Trim and Closure Panels
   1. Perimeter Sealants: Clean and prime joints as recommended by the sealant manufacturer.
   2. Install sealant and related backing material around perimeter of windows in compliance with window and sealant manufacturer's instructions and the requirements of Section 07 92 00.
   3. Apply sealant completely filling the joint and tool smooth to insure full contact with adjacent surfaces.
   4. Strike off excess material.
   5. Finished bead shall be flush with the adjoining surfaces.

K. Completed installation shall be water and weathertight.

3.03 FIELD QUALITY CONTROL

A. Tests: Provide the Following Field Quality Control Testing to Verify Compliance:
   1. 2 areas of testing will be selected by the Architect when window system is approximately 40 percent completed and will be tested for both air and water infiltration.
   2. Upon completion of remaining portions, 1 additional area of testing will be selected by the Architect and tested for both air and water infiltration.
   3. Areas not meeting specified requirements and other areas of similar deficiencies shall be corrected at no additional cost to the Owner.
   4. Costs for Successful Tests: Unsuccessful tests and retests shall be the responsibility of this Section:
      a. For each area that fails, retest that area plus 1 additional area selected by the Architect.
   5. Air Infiltration: Comply with ASTM E783 at 6.24 PSF.
      a. Allowable Limit: 0.09 CFM per square foot.
   6. Water Infiltration: Comply with AAMA 501.3 at 8.0 PSF.
      a. Allowable Limit: No water on interior surface.

3.04 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt form corners. Wipe surface clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

D. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Touch up factory finish.

E. Clean glass of preglazed units promptly after installation of windows; comply with requirements of Section 08 81 00 for cleaning and maintenance.

3.05 PROTECTION

A. Initiate and maintain protection and other precautions required to ensure system will be without damage or deterioration (other than normal weathering) at time of acceptance.

END OF SECTION

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SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Finish hardware for Metal doors.

B. Related Sections
   1. 04 22 00 – Concrete Unit Masonry.
   2. 06 10 00 – Rough Carpentry.
   3. 08 11 00 – Metal Doors and Frames.
   4. 08 11 16 – Aluminum Doors and Frames.
   5. 09 29 00 – Gypsum Drywall.
   6. Division 26 – Conduit and power connections.

1.02 REFERENCES

A. National Fire Protection Agency (NFPA)
   1. NFPA 80.
   2. NFPA 101.

B. Underwriters Laboratories, Inc. (UL)
   1. Building Materials Directory.

C. Warnock Hersey (WH)
   1. Building Materials Directory.

D. ADA
   1. Americans With Disabilities Act.

E. Minnesota State Building Code
   1. 2020 Edition and, International Building Codes 2018 Edition, as adopted by Minnesota State Building Code.

1.03 SUBMITTALS

A. Product Data: Manufacturer's product data sheets.

B. Door Hardware Schedule: The finish hardware supplier shall, prior to ordering and/or delivering, prepare and submit to Architect within ten days after award of contract an electronic PDF detailed and engineered, vertical type hardware schedule conforming to DHI publication, “Sequence and Format of the Hardware Schedule” engineering and detailing door hardware specified ensuring all components work together, 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. Hardware schedules submitted without the AHC’s signature will be rejected without review.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. The Architect will check the Hardware Schedule submitted for quality and types only, but Hardware Supplier shall be solely responsible for quantities, errors, omissions and full conformance with the specifications and the drawings including all addenda and bulletins.

1.04 QUALITY ASSURANCE

A. Where items of hardware are not definitely or correctly specified and is required for the intended operation, such omission, error or other discrepancy should be directed to the Architect prior to the bid date for clarification by addendum. Otherwise, furnish such items in the type, quality and quantity established by this specification for the appropriate service intended. Should any material be ordered without proper coordination, it shall be replaced at no additional cost to the Owner.

B. Installation shall be in compliance with Federal ADA Guidelines, Installation of all hardware (except that noted by storefront supplier) is to be by General Contractor.

C. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
   1. Upon completion of installation, all door assemblies shall be inspected in accordance with NFPA 80 - 4.9 and 5.2.4. Any opening that does not comply with NFPA standards shall be removed and replaced at no additional cost to the Owner.

D. 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, arrange for hardware supplier and manufacturers' representatives to hold 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 for aluminum, hollow metal and FRP doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

E. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site.

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. Compare delivered hardware to Approved Hardware Schedule. Report any shortages or damaged materials to Architect and Supplier within 24 hours of delivery. Shortages not reported will be the Contractor's responsibility.

1.06 WARRANTY

A. 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.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

1.07 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Continuing Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Groups and each referenced section that products are to be supplied under.
   1. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Groups at the end of Part 3.

2.02 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinge with number of hinge knuckles as specified in the Door Hardware Sets.
   1. Quantity: Provide the following hinge quantity, unless otherwise indicated:
      a. Three Hinges: For doors with heights 61 to 90 inches.
      b. One (1) additional hinge for doors 3'-4" wide to 4'-0" wide up to 90 inches high.
      c. One (1) additional hinge for exterior and vestibule doors through 40 inches wide and 90 inches high.
   2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

3. Hinge Sizes: Provide the following hinges in widths sufficient to minimally clear trim.

Thickness	Size
1-3/4 inch Doors	4-1/2 inch by 4-1/2 inch

4. Unless otherwise indicated, provide the following:
   a. Exterior Doors: Heavy weight, stainless steel, ball bearing or oil impregnated bearing hinges.
   b. Interior Doors 40 inches or less: Standard weight, stainless steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
   c. Interior Doors 40 inches or more: Heavy weight, stainless steel, ball bearing or oil impregnated bearing hinges.
5. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings.
   a. Tips: Flat button unless otherwise indicated in hardware groups.
   b. Non-removable Pins: Lockable doors opening outward.
   c. Other Doors: Non-Rising pins.
6. Approved Manufacturers
   a. Bommer Industries, Inc. (BO).
   b. Hager Companies (HA).
   c. Ives Hardware; a division of Allegion plc. (IV).
   d. McKinney Products Company; an ASSA ABLOY Group company (MK).
   e. Stanley Hardware; a division of DormaKaba (ST).

2.03 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with 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. Acceptable Manufacturers:
      a. Ives (IV) CON (# wires) Option.

B. Wiring Harnesses: Provide electric 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 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. Acceptable Manufacturers:
      a. Ives (IV) – CON x (# Wires).

2.04 DOOR OPERATING TRIM

A. Vandal Resistant Pulls: Provide stainless steel anti-ligature design minimizing the opportunity for tampering with a soft black touch coating. Provide with through bolts at non-integrated mounting. Provide with mounting points that mate with exit device or mortise lock. Like Rockwood VRT24
   1. Approved Manufacturers and Products
      a. Burns, Hager, Hiawatha, and Trimco.

2.05 CYLINDERS AND KEYING

A. Provide temporary keyed construction cores and keys for all doors during the construction period. Construction control and operating keys and cores shall not be part of the Owner's permanent keying system or furnished on the same keyway (or key section) as the Owner's permanent keying system.
   1. At end of project and just prior to substantial completion and under direction of Owner or his representative, construction cores shall be removed and returned to the contract hardware distributor and permanent cores installed by Owner/Contractor.
   2. Upon completion of project, and after permanent cores have been installed, the key cabinet, the keying and bitting schedules shall be turned over to the Owner's lock shop.

B. Provide permanent cores for all locks and cylinders keyed into Owner's existing Schlage master key system. All locks and cylinders shall be master-keyed or grand-master keyed as directed by Owner. Owner will supply system expansion requirements.

C. Key Quantity: Provide the following minimum number of keys:
   1. Change Keys per Cylinder: Three (3).
   2. Master Keys (per Master Key Group): Three (3).
   3. Construction Control Keys: Two (2).
   4. Permanent Control Keys (where required): Two (2).
   5. Construction Keys: Ten (10).

D. Visual Key Control:
   1. Stamp "DO NOT DUPLICATE"

E. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall expansion capacity of 150 percent of the number of locks required for the project.
   1. Approved Manufacturers
      a. Lund Equipment (LU).
      b. MMF Industries (MM).
      c. Telkee (TK).

2.06 MECHANICAL LOCKS AND LATCHING DEVICES

A. Provide wrought boxes and curved lip strikes with lip length sufficient to minimally clear trim.

B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified cylindrical (bored) locksets furnished in the functions as specified in the Hardware Sets. Furnish with standard 2 3/4 inch backset, and 1/2 inch (3/4 inches at rated paired openings) throw brass or stainless steel latchbolt. Locks are to be non-handed and fully field reversible.
   1. Acceptable Manufacturers:
      a. Schlage (SC) – ND Series.
      b. No Substitution – Facility Standard.

C. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified mortise locksets furnished in the functions as specified in the Hardware Sets. Locksets to be field-reversible for handing without disassembly of the lock body. Furnish with standard 2 3/4 inch backset, 3/4 inch throw anti-friction stainless-steel latchbolt, and a full 1 inch throw stainless steel bolt for deadbolt functions.
   1. Approved Manufacturers
      a. Schlage (SC) – L9000 Series.
      b. No Substitution – Facility Standard.

D. Lock Trim Design: Match Existing Conditions.

2.07 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:
   1. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
   2. 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. Provide closers meeting requirements to physically handicapped, provide units complying with ANSI/ICC A117.1 provision for door opening and closing force.
   3. Closers shall not be installed on exterior or corridor side of doors, where possible install closers on door for optimum aesthetics. Provide drop plates or other accessories as required for proper mounting.
   4. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt as required.
B. Door Closers, Surface Mounted: ANSI/BHMA A156.4, Grade 1 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 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. Approved Manufacturers
      a. Best Closers (BE) – HD8000 Series.
      b. LCN Closers (LC) - 4050 Series.
      c. Sargent Manufacturing (SA) - 351 Series.
      d. Norton Door Controls (NO) - 7500 Series.

2.08 ARCHITECTURAL TRIM

A. Metal Protection Plates: ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), beveled on four edges (B4E), fabricated from the following.
   1. Stainless Steel: 050-inch thick.

B. Door Protective Trim
   1. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single 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.
      a. Kick Plates: 0.050 inch thickness, beveled edges (B4E) and countersunk screw attachment.
      b. Widths: 2 inches less than door width.
      c. Height: 12 inches or 1/2 inch less than height of bottom rail, whichever is less.

C. Approved Manufacturers
   1. Burns Manufacturing (BU).
   2. Hiawatha, Inc. (HI).
   3. Ives (IV).
   4. Rockwood Manufacturing (RO).
   5. Trimco (TC).

D. Trim Protectors: 3/8" x 1-1/2" solid stainless-steel bar.

	Rockwood
Locksets	R115LBP

   1. Approved Manufacturers: Burns, Hager, Hiawatha, Ives., Rockwood, Trimco.

2.09 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 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as required by wall condition. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

C. Approved Manufacturers
   1. Burns Manufacturing (BU).
   2. Hiawatha, Inc. (HI).
   3. Ives (IV).
   4. Rockwood Manufacturing (RO).
   5. Trimco (TC).
   6. Hager.

D. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Provide non-handed design with mounting brackets as required for proper operation and function. Provide Rixson 9-Series overhead stop for doors that are capable of swinging more than 145-degrees before striking wall and where door strikes fixed object such as sink, cabinet, and similar obstructions.

	ABH	Glynn-Johnson	Rixson
Heavy Duty Concealed	1020SL	GJ-100	1-Series
Heavy Duty Surface	9000	GJ-90	9-Series

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 UBC 7-2, Fire Tests of Door Assemblies.

D. Thresholds: Provide full-saddle type threshold unless floor conditions dictate or detailed otherwise. Provide thresholds with slip resistant" surface like Pemko "PemKote™"
   1. Hardware supplier responsible to verify all finish floor conditions and coordinate proper threshold as required ensuring a smooth transition between threshold and interior floor finishes.

E. Weatherstrip: Install weather strip prior to other surface hardware such as door closers, exit devices ect. to provide full perimeter seal without interruption. Supplier to ensure proper templating of surface hardware allowing for the thickness of the weatherstrip.

F. Automatic Door Bottoms: Provide units with a light-spring action which reduces the operating force to 3-5 pounds required for actuation.
   1. Provide Pemko 420PKL Sponge neoprene for units installed in hollow metal or aluminum doors.
   2. Hardware supplier responsible to verify all finish floor conditions and coordinate proper automatic door bottom as required to prevent snagging between door bottom and interior floor finishes.

G. Approved Manufacturers
   1. National Guard.
   2. Pemko.
   3. Reese.
   4. Zero.

H. Weatherstrip for aluminum doors and frames specified in Section 08-4113.

2.11 CLOTHES HOOKS

A. Approved products of the following manufacturers:
   1. Don-Jo 302.
   2. Ives 582.
   3. Rockwood 796.

2.12 FABRICATION

A. Fasteners
   1. 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. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Exposed Metal Finishes
   1. BHMA 626 / US26D = Satin Chromium plated over nickel, over brass or bronze base metal.
   2. BHMA 652 / US26D = Satin Chromium plated over nickel, over Steel base metal.
   3. BHMA 630 / US32D = Satin Stainless Steel, over stainless-steel base material.
   4. Closers: Waterborne acrylic and powder coat to withstand 100 hours of salt spray.

PART 3 EXECUTION

3.01 INSPECTION

A. Hardware installer and Contractor are responsible to examine all door frames two times after original installation for the following purposes:
   1. First after their initial installation of frames by Contractor and installation of walls boards or masonry units.
   2. Prior to installation of doors and hardware.

B. To verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
   1. Verify that all frames are installed plumb, square and true and will maintain maximum and minimum gap requirements listed in NFPA 80-2010, NFPA 101-2012 before installation of doors and hardware as follows:
      a. Head, Jambs, and meeting edge of pairs gap requirements: 1/8 inch Maximum.
      b. 3/4 inch at sill Maximum.
      c. Any installed door frame that exceeds the minimum or maximum gap requirements, such opening shall be removed and replaced without delay including all necessary products and processes to achieve the specified opening at no additional cost to the Owner.
   2. Examine floor and opening conditions to assure suitability for installation.

C. Provide architect with written report listing conditions detrimental to compliance with requirements of this Section. Accepted installation constitutes acceptance of responsibility for performance.

3.02 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.

3.03 PREPARATION

A. Hollow Metal and FRP Doors and Frames: Comply with ANSI/DHI A115 series.

3.04 INSTALLATION

A. Upon completion of installation, all fire door assemblies shall be inspected in accordance with NFPA 80 - 4.9 and 5.2.4.

B. Install each door hardware item to comply with manufacturer's 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.
   1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
   3. 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.
   4. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
      a. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   5. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
   6. Provide blocking in drywall partitions where wall stops, or other wall mounted hardware is located.

C. Locks
   1. Mount so key enters cylinder with smooth edge down.

D. Door Closers
   1. Install closers on room side of corridor doors, and stair side of stairways.
   2. Lobby doors: Mount on vestibule side.
   3. Exterior doors: Parallel rigid arm installation.
   4. Install closers using only manufacturer-furnished template machine screws for metal doors and manufacturer -furnished wood screws for wood doors.
      a. Coordinate with door supplier to provide proper blocking for surface mounting.

E. Kick plates and armor plates: Bottom within 1/8 inch of door bottom; attach with Phillips head screws.

F. Door Stops: Coordinate blocking requirement with Section 06 10 00.
   1. Position wall stops to catch lever handle or pull.
   2. Wall Stop/ Holder- 6’-6” up from finish concrete floor.

G. Clothes hooks: 48 inches from finish floor on door centerline.

H. Lock Cylinders: Install construction cores to secure building and areas during construction period. At end of project and just prior to substantial completion and under direction of Owner or his representative, construction cores shall be removed and returned to the contract hardware distributor and permanent cores installed.
   1. Furnish permanent cores to Owner for installation.

I. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 07 92 00 - Joint Sealants. Anchor to substrate with stainless steel countersunk screws in stainless steel expansion shields not more than 4 inches from each end and not more than 12 inches on center.

J. Install weather strip prior to other surface hardware such as door closers, exit devices, etc. to provide full perimeter seal without interruption. Supplier to ensure proper templating of surface hardware allowing for the thickness of the weatherstrip.

K. 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.

3.05 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.06 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install 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 and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Owner occupancy.

3.07 DOOR HARDWARE SCHEDULE

A. The hardware groups 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.

B. Coordinate materials listed in this section with other related sections prior to ordering materials. Should any materials be supplied as previously stated, they shall be required to be replaced at no additional cost to the Owner.

OPENINGS WITH ELECTRIFIED HARDWARE START WITH AN "E-" IE: E-44A. THE COMPONENTS INSIDE THE HARDWARE SET WILL HAVE A "⚡" SYMBOL AFTER THEM FOR EASY IDENTIFICATION.

GROUP 1.0 PASSAGE FUNCTION

	Hinges	as specified	US26D	
1	Passage Latchset	ND10S	626	SC
1	Surface Overhead Stop (Hvy Dty) GJ90 Series		630	GJ
1	Gasket	S88 D		PE

Functions: Door normally closed and latched. Both levers always active allowing free passage in either direction.

GROUP 3.0 CLASSROOM FUNCTION

	Hinges	as specified	US26D	
1	Classroom Lockset	ND94TD	626	SC
1	Permanent Core	as specified	626	SC
1	Surface Overhead Stop (Hvy Dty) GJ90 Series		630	GJ
1	Gasket	S88 D		PE

Functions: Door normally closed and latched. Outside lever active unless locked by key in the outside cylinder. Rotating inside lever retracts latch, allowing free egress at all times.

GROUP 4.0 STOREROOM FUNCTION

	Hinges	as specified	US26D	
1	Storeroom Lockset	ND96TD	626	SC
1	Permanent Core	as specified	626	SC
1	Surface Overhead Stop (Hvy Dty) GJ90 Series		630	GJ
1	Gasket	S88 D		PE

Functions: Door normally closed, latched and outside lever is secured. Outside lever always locked. Key in outside cylinder retracts latchbolt for entry. Key can only be removed in locked position. Rotating inside lever retracts latch, always allowing free egress.

GROUP 5.0 OFFICE FUNCTION

	Hinges	as specified	US26D	
1	Office Lockset	ND92TD	626	SC
1	Permanent Core	as specified	626	SC
1	Stop	as required		
1	Coat Hook	796	US26D	RO
1	Gasket	S88 D		PE

Functions: Door normally closed and latched. Outside lever active unless locked by pressing inside pushbutton. Outside lever unlocked by key in outside cylinder. Rotating inside lever unlocks outside lever and always allows free egress. Pushing in and rotating inside pushbutton locks outside lever always requiring key. Rotating inside lever does not unlock outside lever until button is manually turned to unlock position.

GROUP 11.0 PASSAGE FUNCTION - CLOSER

	Hinges	as specified	US26D	
1	Passage Latchset	ND10S	626	SC
1	Closer	4040XP REG / 4040XP EDA	ALUM	LC
1	Kickplate	8400 - 12" x 2" LDW	US32D	IV

1	Stop	as required		
1	Gasket	S88 D		PE

Functions: Door normally closed and latched. Both levers always active allowing free passage in either direction.

GROUP 11.4 PASSAGE FUNCTION - CLOSER

	Hinges	as specified	US26D	
1	Passage Latchset	ND10S	626	SC
1	Closer (spring stop arm)	4040XP SCUSH	ALUM	LC
1	Kickplate	8400 - 12" x 2" LDW	US32D	IV
1	Gasket	S88 D		PE

Functions: Door normally closed and latched. Both levers always active allowing free passage in either direction.

GROUP 11.5 PAIR – PASSAGE FUNCTION

	Hinges	as specified	US26D	
1	Passage Latchset	ND10S x 14-042	626	SC
1	Manual Flushbolt	555 (top bolt only)	US26D	RO
2	Stop	as required		
2	Kick Plate	K1050 – 24” x 2” LDW 4BE CSK	US32D	RO
1	Gasket	S88 D		PE

Functions: Door normally closed and latched. Both levers always active allowing free passage in either direction.

GROUP 12.0 PRIVACY FUNCTION WITH INDICATOR - CLOSER

	Hinges	as specified	US32D	
1	Privacy Lockset w/ Indicator	45HOLT 14H x VIN	626	BE
1	Closer	7500	689	NO
1	Kick Plate	K1050 - 12” x 2” LDW 4BE CSK	US32D	RO
1	Stop	as required		
1	Coat Hook	796	US26D	RO
1	Gasket	S88 D		PE

Functions:

- Door normally closed and latched.
- Outside lever active unless locked by turning inside turn lever.
- Turning inside turn lever secures outside lever; and changes occupancy indicator to “RED Padlock Icon”, identifying room is occupied.
- In case of emergency, the outside lever is unlocked by emergency tool outside.
- Rotating inside lever always retracts latchbolt allowing free egress and changes occupancy indicator to “Padlock Icon Un-Locked”, identifying the room is vacant.

GROUP 13.1 CLASSROOM FUNCTION - CLOSER

	Hinges	as specified	US26D	
1	Classroom Lockset	ND94TD	626	SC
1	Permanent Core	as specified	626	SC
1	Closer (hold-open arm)	4040XP HREG	ALUM	LC
1	Kick Plate	K1050 - 12” x 2” LDW 4BE CSK	US32D	RO

1	Stop	as required		
1	Gasket	S88 D		PE

Functions: Door normally closed and latched. Outside lever active unless locked by key in outside cylinder. Rotating inside lever retracts latch, always allowing free egress.

Door can be pushed open and held open on closer holder arm.

GROUP 13.4 CLASSROOM FUNCTION - CLOSER

	Hinges	as specified	US26D	
1	Classroom Lockset	ND94TD	626	SC
1	Permanent Core	as specified	626	SC
1	Closer (spring stop hold-open arm)	4040XP SHCUSH	ALUM	LC
1	Wall Stop	as required		
1	Gasket	S88 D		PE

Functions: Door normally closed and latched. Outside lever active unless locked by key in outside cylinder. Rotating inside lever retracts latch, always allowing free egress. Door can be pushed open and held open on closer holder arm.

GROUP 13.5 PAIR – CLASSROOM FUNCTION

	Hinges	as specified	US26D	
1	Classroom Lockset	ND94TD	626	SC
1	Permanent Core	as specified	626	SC
1	Manual Flushbolt	555 (top bolt only)	US26D	RO
2	Stop	as required		
2	Kick Plate	K1050 – 24” x 2” LDW 4BE CSK	US32D	RO
1	Gasket	S88 D		PE

Functions: Door normally closed and latched. Outside lever active unless locked by key in outside cylinder. Rotating inside lever retracts latch, always allowing free egress.

GROUP 14.0 STOREROOM FUNCTION – CLOSER

	Hinges	as specified	US26D	
1	Storeroom Lockset	ND96TD	626	SC
1	Permanent Core	as specified	626	SC
1	Closer (spring stop hold-open arm)	4040XP SHCUSH	ALUM	LC
1	Wall Stop	as required		
1	Kick Plate	K1050 - 12” x 2” LDW 4BE CSK	US32D	RO
1	Gasket	S88 D		PE

Functions: Door normally closed, latched and outside lever is secured. Outside lever always locked. Key in outside cylinder retracts latchbolt for entry. Key can only be removed in locked position. Rotating inside lever retracts latch, always allowing free egress.

GROUP 14.5 PAIR – STOREROOM FUNCTION – CLOSER

	Hinges	as specified	US26D	
1	Manual Flushbolt	555 x 18BFB	US26D	RO
1	Storeroom Lockset	ND96TD	626	SC
1	Permanent Core	as specified	626	SC
2	Closer (spring stop hold-open arm)	4040XP SHCUSH	ALUM	LC
1	Coordinator	2600 Series	Black	RO

2	Mounting Bracket	2601 AB / 2601C	Black	RO
1	Astragal Seal	S771 D		PE
1	Overlapping Astragal	by door manufacturer		
2	Wall Stop	as required		
2	Kick Plate	K1050 - 12" x 2" LDW 4BE CSK	US32D	RO
1	Gasket	S88 D		PE

Functions: Door normally closed, latched and outside lever is secured. Outside lever always locked. Key in outside cylinder retracts latchbolt for entry. Key can only be removed in locked position. Rotating inside lever retracts latch, always allowing free egress.

GROUP 16.0 PUSH AND PULL - CLOSER

	Heavy Weight Hinges	as specified	US32D	
1	Push Bar & Offset Pull Set	RM252 x 11XHD x 12XHD	US32D	RO
1	Concealed Overhead Stop	1-x36	630	RF
1	Closer	PR7500 x 7788	689	NO
1	Bracket	6890	689	NO
1	Blade Stop Spacer	6891	689	NO
1	Automatic Door Bottom	420 APKL		PE

Functions:

- Door normally closed. Push/Pull operation.

GROUP 20.0 HARDWARE BY OTHERS

All hardware to be furnished by the door manufacturer or specified elsewhere.

GROUP 27.0 POCKET DOOR

1	Pocket Door Track and Hardware Set			PE
1	Edge Pull	880	US26D	RO
1	Set Flush Pulls	94P x 94L	US32D	RO

GROUP E-44.0 SECURE ELECTRIC LOCK x ACCESS CONTROL READER – CLOSER

	Hinges	as specified			
1	Electric Transfer Hinge	QC8	US26D	MK	⚡
1	Electric Lockset (fail secure)	ND96TDEU-RX x CON	626	SC	⚡
1	Permanent Core	as specified	626	SC	
1	Closer	4040XP REG	ALUM	LC	
1	Kick Plate	K1050 - 12" x 2" LDW 4BE CSK	US32D	RO	
1	Wall Stop	406	US32D	RO	
1	Gasket	S88 D		PE	
1	Wire Harness	CON-xx(P) [door EPT to lockset]		VD	⚡
1	Wire Harness	CON-192(P) [frame EPT to junction box]		VD	⚡
1	ElectroLynx Harness	QC-C1500(P) [electric strike to power supply]		MK	⚡
1	Door Position Switch	679 Series		SE	⚡
1	Power Supply	as required, coordinate w/security contractor			⚡
1	Access Control System	by Owner			⚡

Electrical by Division 26.

Interfacing of Access Control equipment with hardware specified in this section shall be the responsibility of the Access Control System Supplier.

Functions:

- Door normally closed, latched, and outside is secured.
- Outside lever always locked, preventing entry (Secured).
  - Mechanical key in outside cylinder retracts latchbolt for entry. Key can only be removed in locked position.
- A valid credential presented at the card reader will shunt the door position switch then energizes solenoid and unlocks electric strike for entry for preset time than relocks.
- Rotating inside lever retracts latchbolt, always allowing free egress, and internal request-to-exit (RX,) switch shunts the door position switch.
- Loss of power the electric strike is locked (fail secure) free egress always allowed from room.
- Access Control System shall log unsecured violation if door is not closed within a preset time limit (programmed from Card Access System software).

GROUP E-44.2 STOREROOM FUNCTION – ELECTRIC STRIKE – DOUBLE ACCESS CONTROL READER – CLOSER

	Hinges	as specified	US26D		
1	Electric Transfer Hinge	QC8	US26D	MK	⚡
1	Storeroom Lockset	45H7D x Temp Core x Double Keyed	626	BE	
2	Permanent Core	as specified	626		
1	Electric Strike	1006CLB	630	HS	⚡
1	ElectroLynx Adapter	2004M		HS	⚡
1	SMART Pac Bridge Rectifier	2005M3		HS	⚡
1	Closer (spring stop arm)	CPS7500	689	NO	
1	Kick Plate	K1050 - 12” x 2” LDW 4BE CSK	US32D	RO	
1	Electric Strike Guard	150	26D	HS	
1	Wall Stop	406	US32D	RO	
1	Gasket	S88 D		PE	
1	Electric Power Transfer	EL-CEPT	US32D	SU	⚡
1	Power Supply	BPS-24 Series		SU	⚡
1	Door Position Switch	DPS Series		SU	
1	ElectroLynx Harness	QC-Cxxx(P) [EPT to lockset]		MK	⚡
1	ElectroLynx Harness	QC-C1500(P) [EPT to security monitor system]		MK	⚡
1	ElectroLynx Harness	QC-C1500(P) [electric strike to power supply]		MK	⚡
1	Access Control Reader	by Owner			⚡
1	Set Wiring Diagrams	by hardware supplier			

Electrical Boxes, Conductors, and Final Connections to electric hinge, electric strike, door position switch, power supply, and card reader shall be the responsibility of Division 26.
Electrical Service to power supply shall be the responsibility of Division 26

- Door normally closed and latched.
- Outside and inside lever always locked, preventing entry (Secured).
  - Mechanical key in outside or inside cylinder retracts latchbolt for entry. Key can only be removed in locked position.
- A valid credential energizes solenoid and unlocks electric strike allowing entry for preset time, then relocks.
- Access Control System shall log unsecured violation if door is not closed within a preset time limit (programmed from Card Access System software).
- In case of loss of power the electric strike is locked (fail secure) from Storage Room side.

GROUP E-164.2 EXTERIOR - RIM EXIT DEVICE - NIGHTLATCH FUNCTION – CLOSER/STOP

	Heavy Weight Hinges	as specified	US32D		
1	Electric Transfer Hinge	QC8	US26D	MK	⚡
1	Rim Exit Device (nightlatch)	ED5200S K157 M49 M52 M110 VTL957ET	630	RU	
1	IC Cylinder	as required (for exit device trim)	626		
1	Permanent Core	as specified	626		
1	Vandal Resistant Pull	VRT22 C	US32D	RO	
1	Closer/Stop (spring stop arm)	CPS7500	689	NO	
1	Kick Plate	K1050 - 12” x 2” LDW 4BE CSK	US32D	RO	
1	Threshold	252x3 AFG x PemKote		PE	
1	Set Weatherstrip	2891 APK		PE	
1	Sweep	315 CN		PE	
1	Rain Drip	346 C		PE	
1	Electric Power Transfer	EL-CEPT	US32D	SU	⚡
1	ElectroLynx Harness	QC-Cxxx(P) [EPT to exit device]		MK	⚡
1	ElectroLynx Harness	QC-C1500(P) [EPT to junction box]		MK	
1	Door Position Switch	DPS Series		SU	⚡
1	Access Control System	by Owner			

Electrical Boxes, Conductors, and Final Connections to electric power transfer and electric exit device shall be the responsibility of Division 26. Electrical boxes and conduit to door position switch shall be the responsibility of Division 26.

Interfacing of access control equipment with hardware specified in this section and; conductors and final connections to door position switch shall be the responsibility of the access control system supplier.

Functions:

- Door normally closed, latched and outside is secured.
- Key in outside cylinder unlocks turn lever, which retracts latchbolt so the door can be pulled open. Key can only be removed in locked position.
- A valid credential energizes solenoid and unlocks rim exit device allowing entry for preset time, then relocks.
- Depressing touchpad from inside allows free egress at all times and internal request-to-exit (RX/55/M92) switch shunts the door position switch, allowing exit without alarm condition on the access control system.
- Access Control System shall log unsecured violation if door is not closed within a preset time limit (programmed from Card Access System software).

GROUP 216.58 VESTIBULE - PAIR - ALUMINUM - PUSH AND PULL - CLOSER & AUTOMATIC OPERATOR

2	Continuous Hinge	MCK-14HD	CL	MK
2	Push Bar & Offset Pull Set	RM252 x 11XHD x 12XHD	US32D	RO
1	Concealed Overhead Stop	1-x36	630	RF
1	Slide Track Closer	351-OT	EN	SA
1	Automatic Operator	by Section 08 71 16		
2	Actuator Switches	by Section 08 7 116		
1	Presence Sensor	by Section 08 71 16		
1	Wall Stop	406	US32D	RO
1	Set Weatherstrip	(door manufacturer's heavy duty standard)		

Electrical Boxes, Conductors, and Final Connections to automatic operator and actuator switches shall be the responsibility of Division 26. Electrical Service to automatic operator shall be the responsibility of Division 26.

Functions:

- Door normally closed, but not latched. Push/Pull operation.
- Pressing either actuator switch signals the automatic operator to power the door open at a safe speed as indicated in ANSI A117.1. Door will stand open for a preset time, and then close.
- Power Failure or Fire Alarm: In case of loss of power or signal from fire alarm system, the automatic operator is deactivated.

GROUP E-284.8 EXTERIOR – PAIR – ALUMINUM – CVR EXIT DEVICES – NIGHTLATCH FUNCTION – ELECTRIC LATCH RETRACTION X ACCESS CONTROL READER OR TIME LOCK/UNLOCK – CLOSER & AUTOMATIC OPERATOR

2	Continuous Hinge	MCK-14HD x EPT	CL	MK	
1	CVR Exit Device (exit only)	43-55-56-AD8410	US32D	SA	
1	CVR Exit Device (nightlatch)	43-55-56-LC-AD8410 x 106	US32D	SA	
1	IC Cylinder	as required (for exit device trim)	US26D	SA	
1	Permanent Core	as specified	US15	SA	
2	Offset Pull	RM202 x 12XHD	US32D	RO	
2	Concealed Overhead Stop	1-x36	630	RF	
1	Closer	351-P10 x 351-D x 581-2	EN	SA	
1	Automatic Operator	by Section 08 71 16			⚡
2	Actuator Switches	by Section 08 71 16			⚡
1	Presence Sensor	by Section 08 71 16			⚡
1	Threshold	273X3AFG	AL	PE	
1	Set Weatherstrip	(door manufacturer's heavy duty standard)			
1	Astragal	(door manufacturer's heavy duty standard)			
2	Sweep	315 CN		PE	
1	Rain Drip	346 C		PE	
2	Electric Power Transfer	EL-CEPT	US32D	SU	⚡
2	ElectroLynx Harness	QC-Cxxx(P) [EPT to exit device]		MK	⚡
2	ElectroLynx Harness	QC-C1500(P) [EPT to power supply]		MK	⚡
2	Door Position Switch	DPS Series		SU	
1	Power Supply	BPS-24 Series		SU	⚡
1	24/7 Timer	by Access Control System			⚡
1	Access Control Reader	by Owner			⚡
1	Set Wiring Diagrams	by hardware supplier			

Electrical Boxes, Conductors, and Final Connections to electric power transfers, electric exit devices, automatic operator, actuator switches and power supply shall be the responsibility of Division 26. Electrical boxes and conduit to the door position switches, 24/7 timer and access control reader shall be the responsibility of Division 26. Electrical Service to automatic operator and power supply shall be the responsibility of Division 26.
Interfacing of Access Control equipment with hardware specified in this section; and conductors and final connections to the door position switches, 24/7 timer and access control reader shall be the responsibility of the Access Control System Supplier.
Functions:

- Door normally closed, latched and outside is secure.
- Daytime Operation: A timed event (programmed from Card Access System software) activates the outside actuator switch and signals the electric latch retraction for push/pull operation.
  - Pressing either actuator switch signals the automatic operator to power the door open at a safe speed as indicated in ANSI A117.1. Door will stand open for a preset time, and then close.
- After Hours Operation: A timed event (programmed from Card Access System software) de-activates the outside actuator switch and extends (locks) the latches for normal operation (Secured).
  - Key outside unlocks the turn lever which retracts latchbolts. Key can only be removed in locked position.
  - Presenting a valid credential activates the outside actuator switch and signals the electric latch retraction for entry by pull for a preset time, and then relocks.
    - When active, pressing the outside actuator switch signals the automatic operator to power the door open at a safe speed as indicated in ANSI A117.1. Door will stand open for a preset time, then close.
  - Depressing touchpad from inside retracts latchbolt at all times allowing free egress and internal request to exit (55-) switch shunts the door position switch, allowing exit without alarm condition at the Access Control System.
- Pressing the inside actuator switch anytime signals the electric latch retraction, and then the automatic operator will power the door open at a safe speed as indicated in ANSI A117.1. Door will stand open for a preset time, and then close.
- Power Failure or Fire Alarm: In case of loss of power or signal from fire alarm system, the latches are extended and locked (Secured) (Fail Secure), and the automatic operator is deactivated.
- Access Control System shall log unsecured violation if doors are not closed within a preset time limit (programmed from Card Access System software).

END OF SECTION

SECTION 08 71 16

AUTOMATIC DOOR OPERATORS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Electrical door operators in full architectural housing, for swinging doors.
   2. Controls, control wiring, and interface with building power and alarm systems.
   3. Brackets, trim, fasteners, and related accessories

B. Related Sections
   1. 08 11 16 – Aluminum Doors and Frames
   2. 08 71 00 – Door Hardware
   3. Electrical: Refer to Division 26
      a. 120 VAC, single-phase, 15 amp fused circuit to door headers, two 24 VAC Class II wires between door headers and remote activation devices, 1/2 inch conduit and electrical boxes at activators. Low voltage wiring for fire, security, and alarm systems, and for other electrified hardware affecting door operation.

1.02 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A156.19: Power Assist and Low Energy Operated Doors.

B. National Fire Protection Association:
   1. NFPA 80: Standard for Fire Doors and Windows.
   2. NFPA 101: Code for Safety to Life from Fire in Buildings and Structures.

C. Underwriters Laboratories, Inc. (UL):
   1. UL Building Materials Directory.

D. Americans with Disabilities Act (ADA).

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: overhead, surface-mounted, regular speed, low-energy type operators for high traffic doors controlled by wall mounted push plate switches; provide one switch on each side of door.
   1. Locate operators on secure side of opening.
   2. Provide wall-switches as hard-wired.
   3. Operators shall open the door at least 90-degrees and maintain a constant engagement with the door throughout opening and closing cycles.
   4. Operators shall function as standard door closer for manual operation.
   5. Operators shall have adjustable controls for regulating the opening, closing, and latching speeds.
   6. Comply with ANSI A156.19.

1.04 SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures, unless otherwise indicated.

B. Shop Drawings: Include complete elevations of the system(s); details and methods of anchorage; details of construction; finishes; methods of assembly; location and installation of hardware and reinforcement for same; size, shape and thickness of materials; joints and connections; details of joining with other work. Show locations of all components. Show proposed location for door activation switches. Architect may revise location of door activation switches when reviewing shop drawings at no additional cost to Owner or Architect.
   1. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators, including activation and safety devices, with connections to power supplies fire alarm system and access control system.

C. Product Data: Manufacturer's specifications and technical data including the following.
   1. Detailed specification of construction and fabrication.
   2. Manufacturer's installation instructions.

D. Operating and maintenance instructions, parts lists, and wiring diagrams.

E. American Association of Automatic Door Manufacturers (AAADM) certification that operator has been installed and inspected to comply with applicable ANSI standards.

1.05 QUALITY ASSURANCE

A. Where items of hardware are not definitely or correctly specified and is required for the intended service, such omission, error, or other discrepancy shall be directed to the Architect prior to the bid date for clarification by addendum. Otherwise, furnish such items in the type, quality and quantity established by this specification for the appropriate service intended.

B. Qualifications:
   1. Manufacturer's Qualifications: Provide units produced by a firm with not less than 5 years successful experience in the fabrication of automatic door equipment of the type required for this project.
   2. Installer's Qualifications: Engage an installer certified by The American Association of Automatic Door Manufacturers (AAADM) for both the installation and maintenance of the type of units required for this project.
   3. Minimum Experience: Not less than 3 years' experience in the installation and service of automatic door equipment of the same manufacturer.
   4. Maintenance Proximity: Not more than l hour normal travel time from Installer's place of business and project site.

C. Door operators and installation shall conform to ANSI 156.19 "Power Assist and Low Energy Power Operated Doors".

1.06 MAINTENANCE

A. Initial Maintenance Service. Provide a Maintenance Service Contract covering maintenance and callback service on the equipment installed under this Section covering a period of 12 months beginning on the Date of Substantial Completion.

B. Service. Service shall include at least three regularly scheduled preventive-maintenance-service calls, the final inspection and responses to Owner initiated service requests. Service shall not be subcontracted but shall be by the installer.
   1. Regularly Scheduled and Owner Initiated Service Calls shall include adjustments, greasing, oiling, and cleaning, including the supplies and replacement parts needed to keep the equipment in good operation. Except such parts made necessary by misuse, accidents or negligence not caused by the installer.
      a. Conduct at least one preventive-maintenance, service-call per 3-month period using competent and trained technicians.
      b. Response time to Owner Initiated Service Calls shall be within four hours.
      c. Use parts and supplies as specified or suitable for the original installation.
      d. Submit signed and dated copies of service, repair and callback tickets to the Owner.

C. Final Inspection. At least 14 days prior to the scheduled expiration of the Maintenance Service Contract, schedule a Final Inspection with the Owner. The installer shall correct deficiencies cited on this inspection as part of the Maintenance Service Contract without additional cost or inconvenience to the Owner.

D. Maintenance Service provided under this Article is in addition to and not in lieu of guarantees required by the Contract Documents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable manufacturers, products: Heavy-Duty Usage – Include Safety sensors
   1. ASSA ABLOY SW200i Surface Mounted Door Operator
   2. Horton Automatics, Corpus Christi, TX, HD-Swing – SD4100LE
   3. LCN Closures, Princeton, IL, - 9500 / 2800 Senior Swing Series Operators
   4. Stanley Access Technologies, Farmington, CT, - M-Force™ Automatic Swing Door Opener
   5. Others as approved.

2.02 OPERATION

A. Operation: Push button, push plate, switch-activated, or manual opening, with power boost closing and holding; comply with ANSI A156.19 and UL 325.

B. Coordinate with Hardware Group operational requirements specified in Section 08 71 00 – Door Hardware.

C. Emergency Operation. The doors shall operate manually in event of power failure or upon a signal from the building alarm system.

D. Operator: Manufacturer's standard electro-hydraulic unit, powered in opening cycle, spring return in closing cycle, and with speed control to provide checking in both cycles. Provide for easy manual operation when power is off, regardless of ambient temperatures. Equip units with hold-open switch, arranged to hold door open without continued use of power.
   1. Doors shall not open to back check faster than three seconds and shall not require more than 15 pound-force to stop door movement.

E. Operator Action: As indicated by door swing on drawings (swing-in, swing-out, double-swing, pairs, double egress, etc.).
   1. Opening: Open to 90 degrees, maintaining engagement of operating mechanism through opening cycle.
   2. Closing: Close and center door against stop after each cycle and hold against drafts, winds, and stack pressure. Act as manual closer when not powered.
   3. Closing force: As required to close and latch.

F. Adjustment: Microprocessor control for:
   1. Opening speed.
   2. Back check.
   3. Hold open, from 5 to 30 seconds.
   4. Closing speed.
   5. Opening force (torque limiting).
   6. Acceleration during opening and recycling, for soft start.

G. Equipment:
   1. Control box and motor/gear box: Contained in aluminum housing; precision-machined gears and bearing seats and all-weather lubricant.
   2. Terminal strip: In enclosed box above door, indicating connections for fire and security alarm equipment, and other electrified hardware associated with door operation.
   3. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation including spring closing when power is off.
   4. Door operating arm: Forged steel, attached at natural pivot point of door. Exposed arms: Factory polished and finished to match operator enclosure.
   5. Control circuits for actuators: Low voltage, NEC Class II.
   6. Power supply required: 120 VAC.
   7. Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load of 30.
   8. Manual "On-Off-Hold Open" switches.
   9. Keyed Switch: Manufacturer's standard key operated 3-position [on/off] switch; cylinder furnished under Section 08 71 00 – Door Hardware.
      a. "ON" Position: Turns operator on.
      b. "OFF" Position: Turns operator off.
      c. Hold-Open Switch: Toggle switch to hold door in open position.

H. Enclosure: Concealing all operating parts except arms and manual control switches. Access door for access to controls and removable components without removal of door or operator. No exposed fasteners.

I. Aluminum: AAMA 611, Class II, AA-M12C22A33, color anodized to match door frame.

2.03 OPERATING CONTROLS

A. Push plate: Formed stainless steel plate, satin finish; with depressed marking; 2 required per opening. Marking: Handicapped symbol, filled blue.

B. Provide Double Pole Double Throw (DPDT) wall switches when used in conjunction with access control system to activate low energy operator and as a Request-to-Exit (RX) switch to shunt alarm allowing passage without alarm condition.

C. Wall-mounted push button switch: 4-1/2 inch round stainless steel wall-mounted momentary contact pushbutton. Label “Press to Open” with universal handicapped symbol. Provide weather-resistant units at exterior applications similar to:
   1. Wikk “S-4R-3-US32D” – Exterior locations.
   2. Wikk “S-4R-3L-US32D” or ”S-4R-3R-US32D” – Interior vestibule locations.

D. Acceptable Manufacturers:
   1. BEA, Inc., Pittsburgh, PA.
   2. Larco Manufacturing; Brainerd, MN
   3. Norton Door Controls: An ASSA ABLOY Group Company
   4. Stanley Access Technologies, Farmington, CT
   5. Wikk Industries, Inc; Greendale, WI
   6.

E. Provide the following safety sensors for cross corridor doors and exterior doors:
   1. Overhead Safety Sensor shall be Bodyguard Presence Sensor:
      a. BEA Bodyguard-T overhead presence detector with lockout relay and mounting bracket to be supplied for both side safety. This device shall provide a safety pattern at the swing pattern of the door and shall inhibit a closed door from opening or an open door from closing if a pedestrian is within the swing path of the door opening.
   2. Door Mounted Reactivation Sensors shall be BEA series SuperScan Presence Sensor.
      a. BEA SuperScan-T to be mounted on both side of each door (Double egress when concerned about approach side and swing side) to re-open a closing door if pedestrian enters swing path of door. Note: door mounted inhibit position switches are required for this option and are to be supplied by Automatic door installer so that the sensors shut off when door is within 10 degrees of the closed position.

F. Hardware Interface Module:
   1. Interface module shall be BEA Br3 Micro processed multifunction relay module. Relay outputs shall be rated for 3 Amps to accommodate electric hardware.

G. Coordinate installation of switches and sensors with door and frame suppliers, electrical and access security to ensure power requirements and conductor and wire runs.

2.04 MARKINGS

A. Decals: Visible from either side, instructing the user as to the operation and function of the door.

B. Service label: Sticker or plate on operator, showing installer and contact information for service.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
   1. Do not proceed until satisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with ANSI A156.19.

B. Install in accordance with manufacturer's approved shop drawings and in compliance with referenced standards. Members shall be level, square, plumb, at proper elevations and in alignment with other work. Attach and secure to structure as required to assure stability of system.

C. Low Energy Operator Wall Switches:
   1. Actuating control switches:
      a. Shall be mounted between 30 inches and 36 inches above the finished floor.
      b. Shall be located at least 30 inches to 60 inches from the pull arc of the swing of the door but never more than 12 feet.
      c. Must remain accessible from the swing side when the door is opened.
      d. Not be located in a position where the user would be in the path of the moving door.
      e. Mounted so the user is in full sight of the door when activating the switch.

D. Provide internal wiring in devices and/or relays as needed for proper operation of work as specified in this Section and as required to operate hardware specified in 08 71 00; external wiring, conduit, and final connection to power source provided under Division 26. Adjust door operators for proper operation, without binding or scraping and without excessive noise.

E. Verify that electrical connections are made correctly, with dedicated grounding.

F. Furnish AAADM Certified Daily Safety Check.

END OF SECTION

SECTION 08 81 00

GLAZING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Glass for doors and windows.

B. Related Sections
   1. 08 11 00 – Metal Doors and Frames.
   2. 08 11 16 – Aluminum Doors and Frames.
   3. 08 51 13 – Aluminum Windows.

1.02 SUBMITTALS

A. Manufacturer's descriptive data of glass and glazing methods.

B. Recommended installation instructions.

C. Shop drawings showing details of glass installation at framing members, such as head, mullions, jambs, and sills.

D. One 12-inch by 12-inch pieces of each type of glass specified.

1.03 QUALITY ASSURANCE

A. Manufacturer/Fabricator's Qualifications: Not less than 5 years' experience in the actual production of the specified products.

B. Installer Qualifications: Firm with 3 years of experience in installation of systems similar in complexity to those required for this Project, plus other specified requirements:
   1. Acceptable to or licensed by manufacturer.
   2. Successfully completed a minimum of 5 comparable scale projects using this system.

C. Regulatory Requirements: Glass fabricator is responsible for determining specific glass strengths and thicknesses. Strengths and thicknesses indicated on Drawings and specified in this Section are minimum only. Manufacturer's glass sizing and thickness charts shall take precedence over Drawings only where charts indicate thicker or stronger glass:
   1. Tempering: Comply with requirements of CPSC 16, CPR 1201, C11 applicable to this Project. Locations indicated on Drawings are minimum only.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver glass with manufacturer's labels intact.

B. Do not remove labels until glass has been installed, inspected, and approved by Architect.

C. Keep glass free from contamination by materials capable of staining glass.

D. Deliver glazing compounds and sealants in manufacturer's unopened, labeled containers.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Perform glazing when ambient temperature is above 10 degrees F.

B. Perform glazing on dry surfaces only.

1.06 WARRANTY

A. Contractor/manufacturer/installer shall warrant insulated glass for a period of 5 years from Date of Substantial Completion against conditions indicated below. When notified in writing by Owner they shall promptly and without inconvenience and cost to Owner correct said deficiencies in compliance with requirements of A201, 12.2.
   1. Failure of the Hermetic Seal (10 years on Glass):
      a. Condensation, dust collection, or film formation on glass surfaces within the air space.
   2. Breakage resulting from chipped or damaged edge conditions from original installation or thermal stresses.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Acceptable Manufacturers for Glass Substrate
   1. AFG Industries, Inc.
   2. Ford Motor Co., Glass Division.
   3. Pilkington Group.
   4. PPG Industries, Inc., Glass Group.
   5. Or Approved Equal.

B. Acceptable Fabricators for Coated and Laminated Units are limited to:
   1. HGP.
   2. Viracon, Inc.
   3. Interpane Glass Company.
   4. Guardian Industries Corporation.
   5. Oldcastle Glass Group.
   6. Or Approved Equal.

C. Acceptable Fabricators for Clear and Tinted Insulated Glass Units
   1. Any manufacturer/fabricator with a "CBA" classification.

2.02 MATERIALS

A. Note: Provide tempered or heat strengthened glass as indicated or where required by current applicable building codes.

B. Float Glass (**GL-1**): 1/4-inch thickness, unless otherwise indicated. Comply with ASTM C1036, Type 1 (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select). Provide tempered glass where necessary to comply with safety code requirements and/or indicated on the Drawings.

C. 1 Inch Insulated Glass (**GL-2**): Low Emissivity coating, Exterior lite - 1/4-inch thick clear float glass, 1/2-inch air space filled with Argon gas, Interior lite - 1/4-inch thick clear float glass. Provide tempered insulating glass units where necessary to comply with safety code requirements and/or indicated on the Drawings.

D. 1 Inch Tinted Insulated Glass (**GL-3**): Low Emissivity coating, Exterior lite - 1/4-inch thick clear float glass with Solargray® Neutral Reflective Low-E #2, 1/2-inch air space filled with Argon gas, Interior lite - 1/4-inch thick clear float glass. Provide tempered insulating glass units where necessary to comply with safety code requirements and/or indicated on the Drawings.

E. 1-1/8 Inch Safety-Laminated Tinted Insulated Glass (**GL-4**): Low Emissivity coating, Exterior lite – two (2) layers of 3/16-inch thick clear float glass with 0.025-inch thick vinyl interlayer with Solargray® Neutral Reflective Low-E #2, 1/2-inch air space filled with Argon gas, Interior lite - 1/4-inch thick clear float glass. Provide heat-strengthened or tempered insulating glass units where necessary to comply with safety code requirements and/or indicated on the Drawings.

F. Glass-Clad Polycarbonate 1" No Spall (Level 3) (**GL-5**): Exterior Lites – three (3) layers of 1/4 inch thick clear float glass separated by 0.025-inch thick polyurethane or polyvinyl interlayers with 0,075 inch thick polyurethane or polyvinyl interlayer and interior lite of 1/4-inch thick mar-resistant polycarbonate.
   1. Manufacturer: Total Security Solutions, Part # GCP-003-10625-NS_L3, or approved equal.

G. 1/2 Inch Insulated Glass (**GL-6**): Low Emissivity coating, Exterior lite - 1/8-inch thick clear float glass, 1/4-inch air space filled with Argon gas, Interior lite - 1/8-inch thick clear float glass. Provide tempered insulating glass units where necessary to comply with safety code requirements and/or indicated on the Drawings.

H. Safety Glass: 1/4-inch thickness, unless otherwise indicated. All tempered glass shall meet the current requirements of the ASTM C1048 "Standard Specification for Heat Treated Flat Glass Kind HS, Kind FT Coated and Uncoated Glass." All Tempered Glass shall have a permanent logo which signifies Safety Commission 16 CFR-1201 and the safety glass test requirements of ANSI Z-97 (current editions).

2.03 GLAZING TAPE

A. Polymerized butyl, rubber tape, coiled on release paper, manufacturer's standard.

2.04 SEALANT

A. 1 part silicone rubber, FS TT-S-001543 non-sag type, Class B.

2.05 ACCESSORIES

A. Setting Blocks: Neoprene, 70-90 Shore "A" durometer hardness, chemically compatible with glazing sealant or compound, length as recommended by glass manufacturer.

B. Spacers and Shims: Neoprene, 40-50 Shore "A" durometer hardness, chemically compatible with glazing sealant or compound, length as recommended by glass manufacturer.

C. Glazing Points and Wire Spring Clips: Corrosion resistant, manufacturer's standard.

D. Filler Rod: Compressible synthetic rubber or foam, chemically compatible with sealant used.

E. Primer-Sealers and Cleaners: As recommended by glass manufacturer.

PART 3 EXECUTION

3.01 INSPECTION

A. Check that glazing channels are free of burrs, irregularities, and debris.

B. Check that glass is free of edge damage or face imperfections.

C. Do not proceed with installation until conditions are satisfactory.

3.02 PREPARATION

A. Field Measurements
   1. Measure size of frame to receive glass.
   2. Compute actual glass size, allowing for edge clearances.

B. Preparation of Surfaces
   1. Remove protective coatings from surfaces to be glazed.
   2. Clean glass and glazing surfaces to remove dust, oil, and contaminants, and wipe dry.

3.03 INSTALLATION

A. Install glass in accordance with manufacturer's recommended instructions.

3.04 CLEANING

A. Remove excess glazing compound from installed glass.

B. Remove labels from glass surface as soon as installation has been inspected.

C. Wash and polish both faces of glass.

D. Remove debris from Site.

3.05 PROTECTION OF COMPLETED WORK

A. Attach crossed streamers away from glass face.

B. Do not apply markers to glass surface.

C. Replace damaged glass.

END OF SECTION

SECTION 08 81 00

GLAZING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Glass for doors and windows.

B. Related Sections
   1. 08 11 00 – Metal Doors and Frames.
   2. 08 11 16 – Aluminum Doors and Frames.
   3. 08 51 13 – Aluminum Windows.

1.02 SUBMITTALS

A. Manufacturer's descriptive data of glass and glazing methods.

B. Recommended installation instructions.

C. Shop drawings showing details of glass installation at framing members, such as head, mullions, jambs, and sills.

D. One 12-inch by 12-inch pieces of each type of glass specified.

1.03 QUALITY ASSURANCE

A. Manufacturer/Fabricator's Qualifications: Not less than 5 years' experience in the actual production of the specified products.

B. Installer Qualifications: Firm with 3 years of experience in installation of systems similar in complexity to those required for this Project, plus other specified requirements:
   1. Acceptable to or licensed by manufacturer.
   2. Successfully completed a minimum of 5 comparable scale projects using this system.

C. Regulatory Requirements: Glass fabricator is responsible for determining specific glass strengths and thicknesses. Strengths and thicknesses indicated on Drawings and specified in this Section are minimum only. Manufacturer's glass sizing and thickness charts shall take precedence over Drawings only where charts indicate thicker or stronger glass:
   1. Tempering: Comply with requirements of CPSC 16, CPR 1201, C11 applicable to this Project. Locations indicated on Drawings are minimum only.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver glass with manufacturer's labels intact.

B. Do not remove labels until glass has been installed, inspected, and approved by Architect.

C. Keep glass free from contamination by materials capable of staining glass.

D. Deliver glazing compounds and sealants in manufacturer's unopened, labeled containers.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Perform glazing when ambient temperature is above 10 degrees F.

B. Perform glazing on dry surfaces only.

1.06 WARRANTY

A. Contractor/manufacturer/installer shall warrant insulated glass for a period of 5 years from Date of Substantial Completion against conditions indicated below. When notified in writing by Owner they shall promptly and without inconvenience and cost to Owner correct said deficiencies in compliance with requirements of A201, 12.2.
   1. Failure of the Hermetic Seal (10 years on Glass):
      a. Condensation, dust collection, or film formation on glass surfaces within the air space.
   2. Breakage resulting from chipped or damaged edge conditions from original installation or thermal stresses.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Acceptable Manufacturers for Glass Substrate
   1. AFG Industries, Inc.
   2. Ford Motor Co., Glass Division.
   3. Pilkington Group.
   4. PPG Industries, Inc., Glass Group.
   5. Or Approved Equal.

B. Acceptable Fabricators for Coated and Laminated Units are limited to:
   1. HGP.
   2. Viracon, Inc.
   3. Interpane Glass Company.
   4. Guardian Industries Corporation.
   5. Oldcastle Glass Group.
   6. Or Approved Equal.

C. Acceptable Fabricators for Clear and Tinted Insulated Glass Units
   1. Any manufacturer/fabricator with a "CBA" classification.

2.02 MATERIALS

A. Note: Provide tempered or heat strengthened glass as indicated or where required by current applicable building codes.

B. Float Glass (**GL-1**): 1/4-inch thickness, unless otherwise indicated. Comply with ASTM C1036, Type 1 (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select). Provide tempered glass where necessary to comply with safety code requirements and/or indicated on the Drawings.

C. 1 Inch Insulated Glass (**GL-2**): Low Emissivity coating, Exterior lite - 1/4-inch thick clear float glass, 1/2-inch air space filled with Argon gas, Interior lite - 1/4-inch thick clear float glass. Provide tempered insulating glass units where necessary to comply with safety code requirements and/or indicated on the Drawings.

D. 1 Inch Tinted Insulated Glass (**GL-3**): Low Emissivity coating, Exterior lite - 1/4-inch thick clear float glass with Solargray® Neutral Reflective Low-E #2, 1/2-inch air space filled with Argon gas, Interior lite - 1/4-inch thick clear float glass. Provide tempered insulating glass units where necessary to comply with safety code requirements and/or indicated on the Drawings.

E. 1-1/8 Inch Safety-Laminated Tinted Insulated Glass (**GL-4**): Low Emissivity coating, Exterior lite – two (2) layers of 3/16-inch thick clear float glass with 0.025-inch thick vinyl interlayer with Solargray® Neutral Reflective Low-E #2, 1/2-inch air space filled with Argon gas, Interior lite - 1/4-inch thick clear float glass. Provide heat-strengthened or tempered insulating glass units where necessary to comply with safety code requirements and/or indicated on the Drawings.

F. Glass-Clad Polycarbonate 1" No Spall (Level 3) (**GL-5**): Exterior Lites – three (3) layers of 1/4 inch thick clear float glass separated by 0.025-inch thick polyurethane or polyvinyl interlayers with 0,075 inch thick polyurethane or polyvinyl interlayer and interior lite of 1/4-inch thick mar-resistant polycarbonate.
   1. Manufacturer: Total Security Solutions, Part # GCP-003-10625-NS_L3, or approved equal.

G. 1/2 Inch Insulated Glass (**GL-6**): Low Emissivity coating, Exterior lite - 1/8-inch thick clear float glass, 1/4-inch air space filled with Argon gas, Interior lite - 1/8-inch thick clear float glass. Provide tempered insulating glass units where necessary to comply with safety code requirements and/or indicated on the Drawings.

H. Safety Glass: 1/4-inch thickness, unless otherwise indicated. All tempered glass shall meet the current requirements of the ASTM C1048 "Standard Specification for Heat Treated Flat Glass Kind HS, Kind FT Coated and Uncoated Glass." All Tempered Glass shall have a permanent logo which signifies Safety Commission 16 CFR-1201 and the safety glass test requirements of ANSI Z-97 (current editions).

2.03 GLAZING TAPE

A. Polymerized butyl, rubber tape, coiled on release paper, manufacturer's standard.

2.04 SEALANT

A. 1 part silicone rubber, FS TT-S-001543 non-sag type, Class B.

2.05 ACCESSORIES

A. Setting Blocks: Neoprene, 70-90 Shore "A" durometer hardness, chemically compatible with glazing sealant or compound, length as recommended by glass manufacturer.

B. Spacers and Shims: Neoprene, 40-50 Shore "A" durometer hardness, chemically compatible with glazing sealant or compound, length as recommended by glass manufacturer.

C. Glazing Points and Wire Spring Clips: Corrosion resistant, manufacturer's standard.

D. Filler Rod: Compressible synthetic rubber or foam, chemically compatible with sealant used.

E. Primer-Sealers and Cleaners: As recommended by glass manufacturer.

PART 3 EXECUTION

3.01 INSPECTION

A. Check that glazing channels are free of burrs, irregularities, and debris.

B. Check that glass is free of edge damage or face imperfections.

C. Do not proceed with installation until conditions are satisfactory.

3.02 PREPARATION

A. Field Measurements
   1. Measure size of frame to receive glass.
   2. Compute actual glass size, allowing for edge clearances.

B. Preparation of Surfaces
   1. Remove protective coatings from surfaces to be glazed.
   2. Clean glass and glazing surfaces to remove dust, oil, and contaminants, and wipe dry.

3.03 INSTALLATION

A. Install glass in accordance with manufacturer's recommended instructions.

3.04 CLEANING

A. Remove excess glazing compound from installed glass.

B. Remove labels from glass surface as soon as installation has been inspected.

C. Wash and polish both faces of glass.

D. Remove debris from Site.

3.05 PROTECTION OF COMPLETED WORK

A. Attach crossed streamers away from glass face.

B. Do not apply markers to glass surface.

C. Replace damaged glass.

END OF SECTION

SECTION 08 91 19

METAL WALL LOUVERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Exterior wall louvers.

B. Related Sections
   1. 04 21 13 – Brick Masonry.
   2. 04 22 00 – Concrete Unit Masonry.
   3. 06 10 00 – Rough Carpentry.
   4. 07 92 00 – Joint Sealants.
   5. 09 29 00 – Gypsum Drywall.
   6. Dampers and Connections of Mechanical Ductwork: Refer to Division 23.

1.02 SUBMITTALS

A. Product Data: Manufacturer's specifications and technical data, including the following:
   1. Detailed specification of construction and fabrication.
   2. Manufacturer's installation instructions.
   3. Test data or certification indicating water penetration and free area according to AMCA Standard 500.
   4. Certified test reports indicating compliance with specified performance requirements.

B. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, relationship to adjoining work, hardware, and installation procedures.

C. Samples: Submit 2 sets of color samples for color selection.

D. Quality Control
   1. Statement of qualifications for manufacturers.
   2. AMCA certification.
   3. Statement of compliance for performance requirements.

1.03 SYSTEM DESCRIPTION

A. Provide louvers and structural support systems to withstand a design wind load of 40-psf positive and negative.

B. Performance Requirements
   1. Provide louver to permit passage of air velocity of 1,000 feet per minute without blade vibration or noise with static pressure loss of 0.10-inch as measured at 1,000 fpm.
   2. Water Penetration: Less than 0.025 ounce of water per square foot of free area at velocity of 1,000 fpm.
   3. Pressure Drop: Less than 0.10-inch w.g. (intake or exhaust) at a free area velocity of 1,000 fpm.

4. Free Area: Not less than 50 percent.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Not less than 5 years of experience in the actual production of specified products.

B. Installer's Qualifications: Firm with 3 years of experience in installation of systems similar in complexity to those required for this Project, plus the following:
   1. Acceptable to or licensed by manufacturer.
   2. Successfully completed not less than 5 comparable scale projects using this system.

C. Product/Material Qualifications: Provide AMCA certified rating and seal indicating compliance with specified air flow requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Deliver products in original unopened packaging with legible manufacturer's identification.

B. Storage and Protection: Comply with manufacturer's recommendations.
   1. Protect from the elements and from damage.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Acceptable Manufacturers for 6-inch deep Aluminum Wall Louvers
   1. The Airolite Company, Model CB6776.
   2. Arrow United Industries, Model EA-615-D.
   3. Industrial Louvers, Inc., Model 653-XP.
   4. Ruskin Louvers, Inc., Model ELF6375DX.
   5. American Warming and Ventilating, A Mestek Company, Model LE-31.

B. Drawings and Specifications are based on manufacturer's proprietary literature from The Airolite Company. Other manufacturers shall comply with the minimum levels of material and detailing indicated on the Drawings or specified herein.

2.02 MATERIALS

A. Aluminum: Comply with the following:
   1. Aluminum Shapes: Extruded aluminum, ASTM B221.
   2. Sheet Aluminum: ASTM B209.

1.01 CONTINUOUS TYPE WALL LOUVERS – DRAINABLE BLADES

B. 6 Inch Drainable Blade Wall Louver: Aluminum of continuous type design. Construct of not less than 0.081-inch thick extruded aluminum for frame and blades. 6-inch depth with channel shaped frame. Blades at 35-degree slope.
   1. Performance Requirements: Based on 4 foot by 4 foot size unit.
      a. Approximate Free Area: 9.10 square feet (57 percent).
      b. Approximate Pressure Drop, Free Area Velocity at 0.18 Inch Water Gauge: 1,250 fpm.

c. Approximate Water Penetration, 0.01 Ounce per Square Foot of Free Area: 1,250 fpm.

2.03 SCREENS

A. Provide framed removable screens. Insect screens are to be installed on all intake louvers and bird screens on all exhaust louvers.

B. Bird screens shall be galvanized steel mesh with 1/4-inch spacing.

C. Insect screens shall be 18 by 16 mesh aluminum.

2.04 ACCESSORIES

A. Sill At Aluminum Louvers: Not less than 0.080-inch thick extruded aluminum of shape as indicated or required to accommodate construction conditions. Finish same as louver.

B. Insulated Blank-Off Panels: Not less than 0.050-inch thick aluminum plate with louver manufacturer's standard insulation adhered on interior face. Finish exposed exterior surface to match louver finish, unless otherwise indicated.

C. Bituminous Coating: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil thickness per coat.

D. Fasteners: Type 302 stainless steel. Size and type as recommended by louver manufacturer to resist loads.

2.05 FABRICATION

A. Shop/Factory Assembly
   1. Fabricate louvers free of visible defects with tight joints.
   2. Neatly miter corners and reinforce with brackets.
   3. Continuous weld corners and intersections. Grind exposed welds flush and smooth to match original metal before applying finish coating.
   4. Use partial blades to achieve even blade spacing.
   5. At continuous type louvers, provide structural supports and blade braces located at each vertical mullion and at intermediate intervals not more than 72 inches on center to produce an exterior elevation without vertical mullions over the entire assembly.
      a. Integral Structural Steel Supports: Designed by louver manufacturer to resist implied wind loads.
      b. Provide complete with manufacturer's interlocking blade braces.
      c. Structural angles, either steel or aluminum, is the responsibility of louver manufacturer to size and provide.
      d. Provide for thermal movement and expansion of louver assembly and supports.

2.06 FINISHES

A. Anodic Coating: Clean exposed surfaces with caustic etch and anodize to an Architectural Class 1 coating.
   1. Color Anodic Coating: Clean exposed surfaces with medium matte caustic etch and anodize to an Architectural Class 1 coating (thickness not less than 0.7 mil).
      a. As selected by Architect from manufacturer's full range of anodic coatings.

B. Furnish manufacturer's matching touch-up anodic coating for touch-up of fasteners and abrasions.

C. Thoroughly clean, etch, and give metal surfaces a chromate conversion pretreatment before application of the primer coat.

D. Apply a heavy coating of bituminous paint where aluminum contacts masonry, concrete, mortar, plaster, or a dissimilar metal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper and timely completion.
   1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordinate size and location of cutouts in blank-off panels with mechanical installer.

B. Protection: Protect aluminum in contact with masonry, concrete, steel, and other dissimilar materials from galvanic and corrosive action with neoprene gaskets or a coat of bituminous paint applied before installation of aluminum product.

3.03 INSTALLATION

A. Comply with manufacturer's recommendations.

B. Install louvers straight, plumb, level, and in plane of wall at locations indicated.

C. Use concealed fasteners of non-corrosive material compatible with materials encountered.

3.04 PROTECTION

A. After installation, carefully protect Work against disfiguration or damage from mechanical abuse or harmful materials.

3.05 ADJUST AND CLEAN

A. Adjust louvers so moving parts operate smoothly.

B. Repair damage to louvers to match original or replace.

END OF SECTION

SECTION 09 29 00

GYPSUM DRYWALL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Light gauge metal framing.
   2. Gypsum drywall.

B. Related Sections:
   1. 06 10 00 – Rough Carpentry.
   2. 07 21 00 – Insulation.
   3. 07 92 00 – Joint Sealants.
   4. 08 11 00 – Metal Doors and Frames.
   5. 08 11 16 – Aluminum Doors and Frames.
   6. 08 51 13 – Aluminum Windows.
   7. 09 91 00 – Painting.

1.02 QUALITY ASSURANCE

A. Gypsum Board Standard: GA-216 by Gypsum Association.

B. Metal Support Standard: ASTM C754.

C. Installation Standard: Gypsum Construction Handbook, US Gypsum Company.

D. Fire Resistance Rating: Where systems with fire resistance ratings are indicated, provide materials and installations which have been tested and listed by recognized authorities.

E. Manufacturer: Obtain products from a single manufacturer or from manufacturers recommended by the prime manufacturer of gypsum board.

F. Allowable Tolerances: 1/16 inch offset between planes of gypsum base faces, and 1/8 inch in 8 feet for plumb, level, warp, and bow.

1.03 PRODUCT HANDLING

A. Deliver, identify, store and protect gypsum drywall materials to comply with referenced standards.

1.04 JOB CONDITIONS

A. Environmental Conditions: Comply with referenced standards.

PART 2 PRODUCTS

2.01 METAL SUPPORT MATERIALS

A. Wall Framing Materials:
   1. Studs equal to USG 20-gauge galvanized metal studs for walls up to 14 feet in height but limited to deflection of L/360.
   2. Runners: 20-gauge galvanized steel.

B. Furring Members: ASTM C645; 25-gauge, hat-shaped. Where shown as "Resilient," provide manufacturer's special type designed to reduce sound transmission. ASTM C645; 25-gauge, "C" shaped studs for spans over 4'-0".

C. Furring Anchorages: 16-gauge galvanized wire ties, manufacturer's standard wire-type clips, bolts, nails, or screws as recommended by furring manufacturers for the conditions encountered or to meet fire test requirements.

2.02 GYPSUM BOARD PRODUCTS

A. Exposed Gypsum Board: ASTM C588, regular type, unless otherwise indicated:
   1. Edge Profile: Manufacturer's standard.
   2. Thickness: 5/8 inch, unless otherwise indicated on the Drawings.
   3. Sheet Size: Maximum length available which will minimize end joints.
   4. Type X: Provide special fire-retardant gypsum board where indicated or required for fire-resistance rated assemblies.
   5. Tile Backer Board: Silicone-treated core with glass mat moisture protectant coating and embedded glass mats, both sides. The face side is surfaced with heat-cured copolymer water and vapor retardant coating, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

2.03 TRIM ACCESSORIES

A. General: Provide manufacturer's standard trim accessories of types indicated for gypsum drywall, formed of galvanized steel with flanges for concealment in joint compound, including corner beads, edge trim, control joints, RC-1 resilient channels, etc.

B. Wet or Moist Areas: Sheet steel, galvanized.

2.04 JOINT REINFORCEMENT MATERIALS

A. General: Except as otherwise indicated, comply with ASTM C587.

B. Joint Tape: Perforated type.

C. Joint Compound: Ready-mixed vinyl-type for interior use, single multi-purpose grade for entire application.

2.05 MISCELLANEOUS MATERIALS

A. Concealed Acoustic Sealant: Mastic type; non-shrinking, non-migrating, and non-staining.

B. Water-Resistant Sealant: Type recommended by gypsum board manufacturer. Seal cut edges and penetrations of water-resistant backing board.

C. Sound Attenuation Insulation: Formaldehyde-free Acoustical Glass Fiber Insulation, ASTM C665 Unfaced Type 1, Class 25 flame-spread, thickness equal to or greater than stud dimension.

D. Acoustical Sealant: As recommended by manufacturer.

PART 3 EXECUTION

3.01 PREPARATION FOR METAL SUPPORT SYSTEMS

A. Ceiling Anchorages: Coordinate work with structural ceiling work to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling hangers. Furnish concrete inserts, steel deck hanger clips, and similar devices to other trades for installation.

3.02 INSTALLATION OF METAL SUPPORT SYSTEMS

A. Do not bridge building expansion joints with support system, frame both sides of joints with furring and other supports as required.

B. Partition Installation:
   1. Stud System Erection:
      a. Attach steel runners at floor and ceiling to structural elements with suitable fasteners located 2 inches from each end and spaced 16 inches on center.
      b. Position studs vertically with open side facing in same direction, engaging floor and ceiling runners, and spaced 16 inches on center. When necessary, splice studs with 8 inch nested lap and 2 positive attachments per stud flange. Place studs in direct contact with all door frame jambs, abutting partitions, partition corners, and existing construction elements. Where studs are installed directly against exterior walls and a possibility of water penetration through walls exists, install asphalt felt strips between studs and wall surfaces.
      c. Anchor all studs for shelf-walls and those adjacent to door and window frames, partition intersections, corners, and free-standing furring to ceiling and floor runner flanges with metal lock fastener tool or screws. Securely anchor studs to jamb and head anchors of door or borrowed-light frames by bolt or screw attachment. Over metal door and borrowed-light frames, place horizontally a cut-to-length section of runner with a web-flange bend at each end, and secure to strut-studs with 2 screws in each bent web. Position a cut-to-length stud (extending to ceiling runner) at vertical panel joints over door frame header. When attaching studs to steel grid system, structural adequacy of grid to support end reaction of wall must be determined.

C. Ceiling Support Suspension Systems
   1. Furnish concrete inserts, steel deck hanger clips, and similar devices to other trades for installation well in advance of time needed for coordination with other work.
   2. Secure hanger wires to structural support by wire-tying directly to structure where possible, otherwise tie to inserts, clips or other anchorage devices or fasteners as indicated. Wire-tie hanger wires to main runners.
   3. Space main runners 48 inches on center and space hangers 48 inches on center along runners, except as otherwise shown.
   4. Level main runners to a tolerance of 1/4 inch in 12 feet, measured both lengthwise on each runner and transversely between parallel runners.

5. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
6. Space furring members 16 inches on center maximum, except as otherwise indicated.
7. Install auxiliary framing at termination of drywall work, and at openings for light fixtures and similar work, as required for support of both the drywall construction and other work indicated for support thereon.

3.03 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS

A. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 1'–0" in alternate courses of base.

B. Install wall/partition boards vertically to avoid end-butt joints wherever possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.

C. Install gypsum board with face side out. Do not install imperfect, damaged, or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.

D. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.

E. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories. Locate as indicated and as required by reference standards and not to exceed 30 linear feet.

F. Cover both faces of master partition framing with gypsum board in concealed spaces, except in chase walls which are properly braced internally. Except where concealed application is required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 square feet area and may be limited to not less than 75 percent of full coverage.

G. Isolate edges of gypsum board from abutment with structure except at floors. Provide 1/4 inch acoustical sealant, coordinated with trim.

H. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum board with "floating" internal corner construction, unless isolation of the intersecting boards is indicated, unless control or expansion joints are indicated, or unless fire rating is indicated.

I. All interior stud partitions shall receive sound attenuation blankets as specified in Paragraph 2.05.C above for full height of partition.

J. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

K. Use water-resistant board at all wet locations such as toilets, janitor's closets, bathrooms, etc.

L. Extend partition system, including both faces of gypsum board, sound attenuation blankets, etc. to structure above, unless otherwise indicated.

3.04 INSTALLATION OF TRIM AND JOINT REINFORCEMENT

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling to substrate in accordance with manufacturer's instructions and recommendations.

B. Install metal corner beads at external corners of gypsum drywall with 9/16 inch galvanized staples at 9 inches on center on both flanges.

C. Install metal edge trim wherever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flanges for embedment in plaster, except where semi-finishing type is indicated. Install L-type where work is tightly abutted to other work and install special Kerf-type where other work is kerfed to receive long leg of L type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints). Conceal all trim in joint compound.

D. Install metal control joint (beaded type) where required.

E. Install joint reinforcement on gypsum wallboard joints (including internal corners). Comply with manufacturer's recommendations for attachment and embedment of joint reinforcement in plaster or other joint compound. Provide either mesh-type or paper-type joint reinforcement, at Installer’s option, except comply with manufacturer’s recommendations and requirements. Comply with Gypsum Construction Handbook for three-coat application on all gypsum board.

3.05 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840, GA-216 or GA-214:
   1. Locations to receive Level 0 finish (no taping, finishing, or accessories required): Non-fire-rated, non-sound-rated, and non-smoke-rated assemblies in ceiling plenums and concealed areas, and in temporary construction.
   2. Locations to receive Level 1 finish (all joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable): Fire rated, sound rated, and smoke rated assemblies in plenum areas above ceilings, in attics, and in areas where the assembly would generally be concealed.
   3. Locations to receive Level 2 finish (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 to receive moisture resistant gypsum board as a surfacing.

4. Locations to receive Level 3 finish (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. Fastener heads and accessories shall be covered with two separate coats of joint compound): Areas which are to receive heavy or medium-texture (spray or hand applied) before final painting, or where heavy-grade wallcoverings are to be applied as the final decoration. This level of finish is not recommended where smooth painted surfaces or light to medium wall coverings are specified.
5. Locations to receive Level 4 finish (all joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints): All flat and eggshell paints, light textures, or wallcoverings.
6. Locations to receive Level 5 finish (all joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges): Gloss or semi-gloss paints, and areas where severe lighting conditions occur.

3.06 INSTALLATION OF ACOUSTICAL BACKING

A. Install continuously with no cut joints using adhesive as recommended by manufacturer.

3.07 CLEANING AND PROTECTION

A. Remove temporary coverings used to protect other work.

B. Remove spillage promptly from door frames, windows, and other adjoining work. Repair surfaces which have been damaged by plastering work.

C. Protect gypsum drywall work from damage and deterioration during the remainder of the construction period.

END OF SECTION

SECTION 09 31 13

CERAMIC TILE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Porcelain Stone tile for floor and wall applications, using thin-set application method.
   2. Grout, setting materials, and related accessories.

B. Related Sections
   1. 03 30 00 – Cast-In-Place Concrete.
   2. 04 22 00 – Concrete Unit Masonry.
   3. 07 92 00 – Joint Sealants.
   4. 09 29 00 – Gypsum Drywall.

1.02 REFERENCES

A. For installation methods see the 2007 version of the "TCA Handbook for Ceramic Tile Installation" published by the Tile Council of North America, Inc.

1.03 SUBMITTALS

A. Submit for the Architect's Review
   1. Product Data for each tile, grout, and accessory item.
   2. Color Selection Samples for the Following:
      a. Grout colors.
      b. Sealant colors.
   3. Record Samples for the Following:
      a. Each tile type in each size, color, and finish indicated.
      b. Grout colors.
      c. Sealant colors.

B. Submit for the Owner's Use/Records
   1. Statement of Qualifications from manufacturers.
   2. Statement of Qualifications from installer.
   3. Certificates of Compliance for coefficient of friction requirements.
   4. Master Grade Certificate for each tile, in the form, and including information specified in ANSI A137.1.
   5. Manufacturer's published cleaning and maintenance instructions for each type of tile.

1.04 QUALITY ASSURANCE

A. Comply with standards of Tile Council of North America, Inc.

B. Manufacturer's Qualifications: Not less than 5 years of experience in the actual production of the specified products.

C. Installer Qualifications: Firm with not less than 5 years of experience in installation of systems similar in complexity to those required for this Project, plus other specified requirements:
   1. Successfully completed a minimum of 5 comparable scale projects using this system.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original sealed containers with legible labels and hallmarks certifying compliance with reference standards.

B. Deliver mastic grout ready for use.

C. Deliver dry-set mortar in sealed, moisture-proof containers.

D. Store materials under cover so as to prevent damage or contamination.

E. Store at a temperature of not less than 55 degrees F for at least 24 hours before installation.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature within range of 50 to 90 degrees F during and for at least 24 hours after installation of tile materials.

B. Provide adequate ventilation to carry off excess moisture.

C. Do not apply setting materials to surfaces containing frost.

D. Do not install tile in areas where temperature of substrate is above 100 degrees F.

E. Protect adjoining work surfaces before tile work begins.

PART 2 PRODUCTS

2.01 TILES

A. Floor Tile (**CT-1**): 6 inch by 6 inch unglazed porcelain with smooth finish and absorption of not more than 0.5 percent.
   1. Edge Design: Cushion.
   2. Thickness: 1/4 inch.
   3. Tile Colors: Architect shall have option to select from manufacturer's colors in Price Groups 1, 2, 3, and 4.
   4. Standard of Quality: American Olean, Daltile, Crossville, Inc.
   5. Silicone Rubber Grout: Silicone sealant, moisture and mildew resistant type, complying with ANSI A118.6.
   6. Grout Color: As selected from the manufacturer's full range of available colors.

B. Floor Tile (**CT-2**): 12 inch by 12 inch unglazed porcelain with smooth finish and absorption of not more than 0.5 percent.
   1. Edge Design: Cushion.
   2. Thickness: 1/4 inch.
   3. Tile Colors: Architect shall have option to select from manufacturer's colors in Price Groups 1, 2, 3, and 4.
   4. Standard of Quality: American Olean, Daltile, Crossville, Inc.

5. Silicone Rubber Grout: Silicone sealant, moisture and mildew resistant type, complying with ANSI A118.6.
6. Grout Color: As selected from the manufacturer's full range of available colors.

C. Porcelain Base Tile (**CT-3**): 6 inch by 6 inch coved base porcelain stone tile with smooth glazed finish and absorption of not more than 0.5 percent.
1. Edge Design: Cushion.
2. Thickness: 5/16 inch.
3. Tile Colors: Architect shall choose from colors up through Price Group IV.
4. Special Shapes:
5. Coved base.
6. Bullnose edge at locations without wall tile.
7. Standard of Quality: American Olean, Daltile, Crossville, Inc.
8. Silicone Rubber Grout: Silicone sealant, moisture and mildew resistant type, complying with ANSI A118.6.
9. Grout Colors: As selected from the manufacturer's full range of available colors.

D. Porcelain Base Tile (**CT-4**): 6 inch by 12 inch coved base porcelain stone tile with smooth glazed finish and absorption of not more than 0.5 percent.
1. Edge Design: Cushion.
2. Thickness: 5/16 inch.
3. Tile Colors: Architect shall choose from colors up through Price Group IV.
4. Special Shapes:
5. Coved base.
6. Bullnose edge.
7. Standard of Quality: American Olean, Daltile, Crossville, Inc.
8. Silicone Rubber Grout: Silicone sealant, moisture and mildew resistant type, complying with ANSI A118.6.
9. Grout Colors: As selected from the manufacturer's full range of available colors.

E. Porcelain Wall Tile (**CT-5**): 12-inch by 12-inch porcelain stone tile with smooth glazed finish and absorption of not more than 0.5 percent.
1. Edge Design: Cushion.
2. Thickness: 5/16-inch.
3. Tile Colors: Architect shall choose from colors up through Price Group IV.
4. Special Shapes:
5. Bullnose edge.
6. Standard of Quality: American Olean, Daltile Crossville, Inc.
7. Silicone Rubber Grout: Silicone sealant, moisture and mildew resistant type, complying with ANSI A118.6.

F. Trim: Include all trim and accessories needed for a complete installation. Base trim shall match tile and shall terminate in a bullnose where wall tile is not specified.

2.02 SETTING MATERIALS

A. Portland Cement: ASTM C150, Type 1.

B. Sand: ASTM C144.

C. Water: Potable.

D. Lime: ASTM C206, Type S or ASTM C207, Type S.

E. Bond Coat: Dry - Set Mortar - ANSI 118.1.

F. Latex: Portland Cement Mortar - ANSI 118.4.

G. Reinforcement: 2-inch by 2-inch by 16/16-gauge welded wire mesh, or equivalent.

H. Metal Lath: Galvanized or painted expanded metal lath.

I. Cleavage Membrane: 15 lb. roofing felt or 4-mil polyethylene film.

2.03 EXPANSION JOINTS

A. Back Up Strip: Flexible, compressible, close-cell foam polyethylene or butyl rubber, rounded at surface to contact sealant.

2.04 THRESHOLDS

A. Solid surface transition strip by Corian or approved equal at doors where floor finish changes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before tiling, make sure variations of surface to be tiled fall within maximum variations shown below:
   1. Dry Set Mortar: (Walls) 1/8-inch in 8-feet; (Floors) 1/8-inch in 10-feet.

B. Report all unacceptable surfaces to the Architect and do not tile such surfaces until they are leveled enough to meet above requirements. Leveling coat is included in this Section.

C. Before tiling commences visually confirm surfaces to be tiled are free from coating, curing membranes, oil, grease, wax, and dust.

3.02 LAYOUT

A. Determine locations of all movement joints before starting tilework.

B. Lay out all tilework so as to minimize cuts less than 1/2 tile in size.

C. Locate tile cuts in both walls and floors so as to be least conspicuous.

D. Align all floors and wall joints to give straight uniform grout lines parallel with walls.

E. All tile joints shall be the same width.

F. Porcelain base shall be installed first and ceramic tile shall be installed flush with abutting surface of base. Under no circumstances shall porcelain base be installed on top of ceramic tile flooring.

3.03 WORKMANSHIP

A. Supply first-class workmanship in all tilework.

B. Use all products in strict accordance with recommendations and directions of manufacturer.

C. Proportion all mixes in accordance with latest ANSI Standard Specifications.

D. Be sure all tilework is free of grout film upon completion.

E. Be sure cut tile edges are clean before installing.

F. Fit tile carefully against trim, accessories, pipe, electrical boxes, and other built-in fixtures so that escutcheons, plates, and collars will completely overlap cut edges.

G. Be sure tilework is free of grout film upon completion.

3.04 SETTING METHODS

A. Ceramic Floor Tile - Tile Council of North America, Inc. Method:
   1. F113 - Dry set mortar to be used for cast-in-place concrete.

B. Porcelain Ceramic Base and Wall Tiles - Tile Council of North America, Inc. Method:
   1. W202 - Dry set mortar.

3.05 GROUTING

A. Follow grout manufacturer's recommendations as to grouting procedures and precautions.

B. Remove all grout haze, observing grout manufacturer's recommendations as to use of acid and chemical cleaners.

C. Rinse tilework thoroughly with clean water before and after chemical cleaners.

D. Polish surface of wall tiles with a soft cloth.

3.06 PROTECTION FROM CONSTRUCTION DIRT

A. Cover all tile floors with heavy-duty, non-staining construction paper, masked in place.

3.07 EXPANSION JOINTS

A. Provide expansion joints as recommended by Tile Council of America in any room larger than 12 feet in any dimension.

3.08 PROTECTION FROM TRAFFIC

A. Prohibit all foot and wheel traffic from using newly tiled floors for at least 7 days.

B. Place large, flat boards in walkways and wheel ways for 7 days where use of newly tiled floors with cement type grout is unavoidable.

END OF SECTION

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SECTION 09 51 00

ACOUSTICAL TREATMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Ceiling suspension system.
   2. Acoustical ceiling panels.

B. Related Sections
   1. 03 40 00 – Hollow Core Precast Concrete Plank.
   2. 05 21 00 – Steel Joist Framing.
   3. 09 29 00 – Gypsum Drywall.
   4. Division 22 or 23.
   5. Division 26.

1.02 SUBMITTALS

A. Product data.
   1. Record Samples of the following:
      a. Each type, color, and pattern of ceiling panel; samples shall be 12 by 12 inches cut from corners of different panels.
      b. Factory finished metal, exposed in the finished work; samples shall be not less than 8 linear inches.

B. Submit for the Owner's Use/Records
   1. Statement of Qualifications from manufacturers.
   2. Statement of Qualifications from installer.
   3. Certificate of Compliance for installation standards.
   4. Certified Copies of test reports for performance requirements.
   5. Certified Copies of test reports for regulatory requirements.
   6. Manufacturer's Maintenance Instructions.
   7. Extra ceiling suspension system components and acoustical tiles equal to 1 percent of the area of the completed system, but not less than 6 full tiles of each type specified.
   8. Material Safety Data Sheets.

C. Reflected ceiling drawing showing layout of suspended ceiling system, including location of light fixtures, grilles, registers, sprinkler heads, etc. Coordinate this Work with other trades.

1.03 QUALITY ASSURANCE

A. Installer's Qualifications
   1. Acceptable to or licensed by manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver material in original, unopened, protective packaging with manufacturer's labels indicating brand name, pattern, size, thickness, and fire rating as applicable, legible, and intact.

B. Store materials in original protective packaging to prevent soiling, physical damage, or wetting.

C. Store cartons open at each end to stabilize moisture content and temperature.

D. Do not begin installation until sufficient materials to complete a room are received.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Complete installation of dampening materials before beginning work.

B. During and after installation, maintain humidity within 5 percentage points of humidity to which space was designed.

C. Maintain a uniform temperature in the range of 55 degrees F to 70 degrees F prior to and during installation of materials.

D. Do not install acoustical ceilings until work to be performed in plenum space above is completed, tested, and approved.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Suspension Systems
   1. Armstrong World Industries, Inc.
   2. Chicago Metallic Corporation.
   3. USG Interiors, Inc. Donn® Brand Suspension Systems.
   4. Or approved equal.

B. Ceiling Panels
   1. Armstrong World Industries, Inc.
   2. Celotex Corporation.
   3. USG Interiors, Inc.
   4. Or approved equal.

2.02 ACOUSTIC CEILING SYSTEM 1 (**ACT-1**)

A. Suspension System: Non-fire rated, 15/16 inch wide exposed flange, tee-grid, single web, intermediate duty ASTM C635, cold rolled electro-galvanized steel system.
   1. Color: White, low luster, factory finished.

B. Acoustical Ceiling Panel: 24 inches by 24 inches by 3/4 inch thick fissured board with shadowline edges, uniquely textured cast product with durable surface. Tiles shall have a warranty against visible sag, mold, and mildew.
   1. Color: White.
   2. Ceiling Tiles shall meet the following:

a. USG Sandrift™ 808 Acoustical Panels (Standard of Quality).
   1) Noise Reduction Coefficient (NRC): Not less than 0.70.
   2) Ceiling Attenuation Class (CAC): Not less than 35.
   3) Light Reflectance (LR): Not less than 82 percent.

2.03 ACOUSTIC CEILING SYSTEM 1 (**ACT-2**)

A. Suspension System: Non-fire rated, 15/16 inch wide exposed flange, tee-grid, single web, intermediate duty ASTM C635, cold rolled electro-galvanized steel system.
   1. Color: White, low luster, factory finished.

B. Acoustical Ceiling Panel: 24 inches by 24 inches by 3/4 inch thick fissured board with tegular edges, fine-textured, unperforated and nonfissured appearance. Tiles shall have a warranty against visible sag, mold and mildew.
   1. Color: White.
   2. Ceiling Tiles shall meet the following:
      a. USG Radar™ High-NRC/High-CAC 22523 Acoustical Panels (Standard of Quality).
         1) Noise Reduction Coefficient (NRC): Not less than 0.70.
         2) Ceiling Attenuation Class (CAC): Not less than 35.
         3) Light Reflectance (LR): Not less than 82 percent.

2.04 ACCESSORIES

A. Wall Moldings: By the same manufacturer as suspension system components. Fabricate from cold-rolled steel. Furnish with fabricated inside and outside corners.

B. Hanger Wire: ASTM A641, Class 1, zinc coating, soft temper for suspended and furred ceilings, not less than 12 gauge.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper and timely completion
   1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Follow the manufacturer's recommendations; produce finished ceilings true to lines and levels indicated and free from warped, soiled, or damaged suspension system components or ceiling panels.

B. Install ceiling systems to support superimposed loads, with permissible deflection of not more than 1/360 of span and surface deviation of not more than 1/8 inch in 10 feet.

C. Layout pattern in compliance with reflected ceiling plans. Where not otherwise indicated, layout the work so that margins on opposite sides of rooms are approximately equal and greater than 1/2 tile in width.

D. Cooperate with other trades to locate items in ceilings. Fit acoustical materials accurately to all such items.

E. Install acoustical materials having a directional pattern with the pattern in a single direction as indicated.

F. Suspension Systems
   1. Install suspension system according to ASTM C636, "Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels" and according to manufacturer's recommendations.
   2. Exposed Suspension System
      a. Install main-runners and cross-tees in arrangement indicated, accurately level and tie to hanger wires.
      b. Install main-runners and cross-tees to provide framing at entire perimeter of each opening, such as light fixtures, diffusers, grilles, and acoustic panels.
      c. Install wall moldings at area perimeters and at columns and similar penetrations.
      d. Hang main runners 4 feet on center, then install cross-tees to complete the grid pattern indicated.
   3. Hanger Wires
      a. Securely attach hanger wires to structure above. Hang vertically without kinks or bends.
      b. Space hangers along main runners following the manufacturer's recommendations, but not more than 4 feet on center each way. Reinforce the system to support acoustical material, light fixtures, diffusers, registers, grilles, and other equipment.
      c. Where provisions have not been made in the structure for attachment of hanger wires, provide special attachment devices that have been certified by test.
      d. Do not support suspension system from electrical conduit or mechanical ducts, pipes, or equipment:
         1) Where ductwork, piping, or other interferences make it impossible to provide direct-to-structure suspension within the allowable spacing, provide trapeze suspension system.
         2) No swing hangers will be permitted.
      e. Provide additional hanger wires at the corners of fixtures supported by the suspension system if the fixtures would cause deflection in excess of the specified performance requirements.
      f. Do not splay wires more than 5 inches in a 4-feet vertical drop; wrap wire a minimum of 3 times and turn ends up.

G. Acoustic Panels
   1. Set panels flush and level in each opening not otherwise occupied.
   2. Cut panels where required to fit panels to perimeter conditions or ceiling penetrations. Make field cuts to provide edge profile that matches factory edge; paint or treat cut surfaces as recommended by the manufacturer.
   3. Install hold-down clips for each panel where indicated.

3.03 CLEANING

A. Clean soiled or discolored unit surfaces after installation.

B. Touch-up scratches, abrasions, voids, and other defects in painted surfaces.

C. Remove and replace damaged or improperly installed units.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Resilient flooring.
   2. Rubber base.

1.02 QUALITY ASSURANCE

A. Minimum of 3 years' experience installing resilient flooring with 10 installations of similar size.

1.03 SUBMITTALS

A. 2 standard sample kits for each product specified for color selection by Owner.

B. 2 copies of list of recommended maintenance products and recommended maintenance methods and procedures.

C. Additional resilient flooring materials of each type specified for replacement and maintenance at a rate of 1 carton or roll for each 1,500 square feet.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Site in manufacturer's original, unopened containers with labels indicating brand names, colors and patterns, and quality designations legible and intact.

B. Do not open containers or remove markings until materials are inspected and accepted.

C. Store and protect accepted materials in accordance with manufacturer's directions and recommendations.

D. Unless otherwise directed, store materials in original containers at not less than 70 degrees F for not less than 24 hours immediately before installation.

1.05 ENVIRONMENTAL CONDITIONS

A. Maintain temperature in space to receive tile between 70 degrees F and 90 degrees F for not less than 24 hours before and 48 hours after installation.

B. Maintain minimum temperature of 55 degrees F after flooring is installed.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Armstrong.

B. Kentile Floor.

C. Roppe.

D. Tarkett.

2.02 VINYL COMPOSITION TILE (**VCT**)

A. Colors: As selected from manufacturer's full range of available colors.

B. Size: 12 inch by 12 inch.

C. Gauge: 1/8.

D. Reference Specification: ASTM F1066.

2.03 BASE MATERIALS (**RB**)

A. Manufacturers: Roppe, Johnsonite.

B. Material: Rubber with ribbed back.

C. Profile: Height 4 inches, gauge 0.080 inch.

D. Toe: Coved at hard surface floors.

E. Corners (Inside and Outside): Preformed.

F. Colors: As selected from manufacturer's full range of available colors.

2.04 APPLICATION MATERIALS

A. General: Provide type and brands of adhesive as recommended by manufacturer of covering material for the conditions of installation.

PART 3 EXECUTION

3.01 INSPECTION OF SURFACES

A. Examine substrate for excessive moisture content and unevenness which would prevent execution and quality of resilient flooring as specified.

B. Do not proceed with installation of resilient flooring until defects have been corrected, except where correction is indicated under PREPARATION in this Section.

3.02 PREPARATION

A. Remove dirt, oil, grease, or other foreign matter from surfaces to receive flooring covering materials.

3.03 APPLICATION OF ADHESIVES

A. Mix and apply adhesives in accordance with manufacturer's instructions.

B. Provide safety precautions during mixing and applications as recommended by adhesive manufacturer.

C. Apply Uniformly Over Surfaces:
   1. Cover only that amount of area which can be covered by flooring material within the recommended working time of the adhesive.
   2. Remove any adhesive that dries or films over.
   3. Do not soil walls, bases, or adjacent areas with adhesives.
   4. Promptly remove any spillage.

D. Apply adhesives with notched trowel or other suitable tool.

E. Clean trowel and re-work notches as necessary to insure proper application of adhesive.

3.04 INSTALLATION OF TILE MATERIALS

A. Lay tile to center of room or space.

B. Work toward perimeter.

C. Do not lay tile less than 1/2 the width of a field tile, except where accepted by Architect/Engineer for irregularly shaped rooms or spaces.

D. Cut border tile neatly and accurately to fit within 1/64 inch of abutting surfaces.

E. Fit flooring material neatly and tightly into breaks and recesses, against bases, around pipes and penetrations, under saddles or thresholds, and around permanent cabinets and equipment.

F. Lay tile parallel to room axis in straight courses with cross-joints in line; lay tile with grain or pattern running in same direction between adjacent tiles.

G. Feature Strips and Inserts:
   1. Provide borders, strips, or inserts where indicated on the Drawings.
   2. Cut to shapes, sizes, and profiles as shown on Drawings.
   3. Carefully scribe into positions on field.
   4. Install feature strip to match width of door frame at door jambs between rooms with different colors or patterns of tile as noted on the Drawings.

3.05 INSTALLATION OF BASE

A. General:
   1. Install base around perimeter of room or space and at casework toe space.
   2. Unroll base material and cut into accurate lengths as desired or as required for minimum number of joints.
   3. Match edges at all seams or double cut adjoining lengths.
   4. Install with tight butt joints with no joint widths greater than 1/64 inch.

B. Toe Type Base:
   1. Apply adhesive and firmly adhere to wall surfaces.
   2. Press down so that bottom cove edge follows floor profile.
   3. Form internal corners by using pre-molded corners.
   4. Form external corners by using pre-molded corners.

5. Scribe base accurately to abutting materials.

3.06 FINISHING AND CLEANING

A. Upon completion of the installation of floor covering, adjacent work, and after materials have set, clean surfaces with a neutral cleaner as recommended by the manufacturer for the type of floor covering material installed.

B. Apply 2 coats of non-slip wax or other finish as recommended by the floor covering manufacturer and buff to a sheen.

C. Protect completed work from traffic and damage until acceptance by the Owner.

END OF SECTION

SECTION 09 65 16

RESILIENT SHEET FLOORING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Resilient sheet flooring (**RSF**).
   2. Rubber base (**RB**).

1.02 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS

A. Select an installer who is competent in the installation of Armstrong resilient sheet flooring using heat-welded seams.

B. If required, provide types of flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.

C. If required, provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory.
   1. ASTM E648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.
   2. ASTM E662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

1.03 SUBMITTALS

A. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions (latest edition of "Armstrong Guaranteed Installation System," F-5061 and the "Medintech Installation and Maintenance Tip Sheet," F-7422.) for flooring and accessories.

B. Submit the manufacturer's standard samples showing the required colors for flooring, welding rods, and applicable accessories.

C. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.

1.04 ENVIRONMENTAL CONDITIONS

A. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.

B. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

C. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65 degrees F (18 degrees C) and a maximum temperature of 100 degrees F (38 degrees C) for at least 48 hours before, during, and for not less than 48 hours after installation.

Thereafter, maintain a minimum temperature of 55 degrees F (13 degrees C) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.

D. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

PART 2 PRODUCTS

2.01 RESILIENT SHEET FLOORING MATERIALS (**RSF**)

A. This specification is based on proprietary information from Armstrong World Industries, Inc. Comparable products from Congoleum Corp., Mannington Commercial, and Tarkett shall be acceptable.

B. Provide Medintech Homogeneous Vinyl Sheet Flooring, nonlayered and nonbacked, manufactured by Armstrong World Industries, Inc., 72 inches (1.83 m) wide, having a nominal total thickness of 0.080 inch (2.0 mm). The polyurethane-coated wear surface shall be composed of polyvinyl chloride resin, plasticizers, stabilizers, fillers, and pigments comprising a through-grain vinyl chip visual with pattern and color uniformly dispersed throughout the entire thickness. The design shall merge subtle color accents with a detailed, terrazzo-like image providing a monolithic appearance. Vinyl sheet flooring shall meet ASTM F1913, “Standard Specification for Vinyl Sheet Floor Covering Without Backing:”
   1. Colors: As selected from the range currently available from manufacturer.

C. Provide vinyl weld rod as produced by Armstrong World Industries, Inc., and intended for heat welding of seams. Color shall be compatible with field color of flooring or as selected by Architect to contrast with field color of flooring. Color selected from the range currently available from Armstrong World Industries, Inc.

2.02 WALL BASE MATERIALS

A. Rubber wall base (**RB**)
   1. Manufacturers: Roppe, Johnsonite.
   2. Material: Rubber with ribbed back.
   3. Profile: Height 4 inches, gauge 0.080 inch.
   4. Toe: Coved at hard surface floors.
   5. Corners (Inside and Outside): Preformed.
   6. Colors: As selected from the range currently available from manufacturer.

2.03 ADHESIVES

A. Provide Armstrong S-240 High-Performance Epoxy Flooring Adhesive for field areas and Armstrong S-580 Flash Cove Adhesive at flash coving, or S-725 Wall Base Adhesive at the wall base as recommended by the flooring manufacturer.

2.04 ACCESSORIES

A. For patching, smoothing, and leveling monolithic concrete subfloors provide Armstrong S-194 Fast-Setting Cement-Based Patch and Underlayment.

B. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.

C. Provide top edge trim caps of plastic for integral flash cove as approved by the Architect.

D. Provide transition/reducing strips tapered to meet abutting materials.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.

B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.

C. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

D. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.02 PREPARATION

A. Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with Armstrong S-194 Fast-Setting Cement-Based Patch and Underlayment as recommended by the flooring manufacturer.

B. Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents.

C. Perform subfloor Calcium Chloride Tests (and Bond Tests) as described in publication F-5061, "Armstrong Guaranteed Installation System," to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring.

D. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.03 INSTALLATION OF SHEET FLOORING

A. Install flooring in strict accordance with the latest edition of "Armstrong Guaranteed Installation System," F-5061 and “Medintech Installation and Maintenance Tip Sheet,” F-7422.

B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.

C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.

D. Scribe, cut, and fit or flash cove to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.

E. Adhere flooring to the subfloor without cracks, voids, raising and puckering at the seams. Roll with a 100-pound (45.36 kilogram) roller in the field areas. Hand-roll flooring at the perimeter and the seams to assure adhesion. Refer to specific rolling instructions of the flooring manufacturer.

F. Lay flooring to provide a minimum number of seams. Avoid cross seams, filler pieces, and strips. Match edges for color shading and pattern at the seams in compliance with the manufacturer's recommendations.

G. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

H. Prepare heat-welded seams with special routing tool supplied for this purpose and heat weld with vinyl welding rod in seams. Use methods and sequence of work in conformance with written instructions of the flooring manufacturer. Finish all seams flush and free from voids, recesses, and raised areas.

3.04 INSTALLATION OF ACCESSORIES

A. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.

B. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.

3.05 CLEANING AND PROTECTION

A. Perform initial maintenance according to the latest edition of "Armstrong Guaranteed Installation System," F-5061 and “Medintech Installation and Maintenance Tip Sheet,” F-7422.

B. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

END OF SECTION

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SECTION 09 77 20

DECORATIVE FIBERGLASS REINFORCED WALL PANELS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Prefinished polyester glass reinforced plastic sheets adhered to concrete masonry units or gypsum board partitions.
   2. PVC and/or harmonizing trim.

B. Related Sections
   1. Section 06 10 00 – Rough Carpentry.
   2. Section 07 92 00 – Joint Sealants.
   3. Section 09 29 00 – Gypsum Drywall.

1.02 REFERENCES

A. American Society for Testing and Materials: Standard Specifications (ASTM)
   1. D-256 – Izod Impact Strengths (ft #/in).
   2. D-570 – Water Absorption (percent).
   3. D-638 – Tensile Strengths (psi) & Tensile Modulus (psi).
   4. D-790 – Flexural Strengths (psi) & Flexural Modulus (psi).
   5. D-2583 – Barcol Hardness.
   6. D-5319 – Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
   7. E-84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.

C. Selection Samples: Submit manufacturer’s standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

D. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.
   1. Submit complete with specified applied finish.
   2. For selected patterns show complete pattern repeat.
   3. Exposed Molding and Trim: Provide samples of each type, finish, and color.

E. Manufacturers Material Safety Data Sheets (MSDS) for adhesives and sealants prior to their delivery to the site.

1.04 QUALITY ASSURANCE

A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
   1. ASTM E-84 (Method of test for surface burning characteristics of building Materials)
      a. Wall Required Rating – Class C.

B. Sanitary Standards: System components and finishes to comply with:
   1. United States Department of Agriculture (USDA) requirements for food preparation facilities, incidental contact.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials factory packaged on strong pallets.

B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (70 degrees F) for 48 hours prior to installation.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70 degrees F) and ventilation consistent with good working conditions for finish work.

B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
   1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.07 WARRANTY

A. Furnish one-year guarantee against defects in material and workmanship.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURER

A. Marlite: 202 Harger Street, Dover, OH 44622. 800-377-1221, Fax (330) 343-4668, Email: info@marlite.com www.marlite.com.

B. Products:
   1. Standard FRP (**FRP-1**) with PVC trim.

2.02 PANELS (FRP)

A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
   1. Coating: Multi-layer print, primer and finish coats or applied over-layer.

2. Dimensions:
    a. Thickness – 0.090 inch (2.29mm) nominal.
    b. Width - 4'-0" (1.22m) nominal.
    c. Length – 10'-0" (3.0m) nominal.
3. Tolerance:
    a. Length and Width: +/-1/8 inch (3.175mm).
    b. Square - Not to exceed 5/32 inch (3.96mm) for 10 foot (2.4m) panels.

B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
1. Flexural Strength - 1.0 x 10^4 psi per ASTM D 790. (7.0 kilogram-force/square millimeter).
2. Flexural Modulus - 3.1 x 10^5 psi per ASTM D 790. (217.9 kilogram-force/square millimeter).
3. Tensile Strength - 7.0 x 10^3 psi per ASTM D 638. (4.9 kilogram-force/square millimeter).
4. Tensile Modulus - 1.6 x 10^5 psi per ASTM D 638. (112.5 kilogram-force/square millimeter).
5. Water Absorption - 0.72 percent per ASTM D 570.
6. Barcol Hardness (scratch resistance) of 35 55 as per ASTM D 2583.
7. Izod Impact Strength of 72 ft. lbs./in ASTM D 256.

C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.

2.03 ACCESSORIES

A. Fasteners: Non-staining nylon drive rivets.
1. Match panel colors.
2. Length to suit project conditions.

B. Adhesive
1. Marlite C-551 FRP Adhesive - Water- resistant, non-flammable adhesive.

C. Sealant
1. Marlite Brand MS-250 Clear Silicone Sealant.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
1. Verify that stud spacing does not exceed 24 inch (61cm) on-center.

B. Repair defects prior to installation.
1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.02 INSTALLATION

A. Comply with manufacturer's recommended procedures and installation sequence.

B. Cut sheets to meet supports allowing 1/8 inch (3 mm) clearance for every 8 foot (2.43m) of panel.
1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.

2. Pre-drill fastener holes 1/8 inch (3.175mm) oversize with high speed drill bit.
    a. Space at 8 inches (20.32cm) maximum on center at perimeter, approximately 1 inch from panel edge.
    b. Space at in field in rows 16 inches (40.64cm) on center, with fasteners spaced at 12 inches (30.48 cm) maximum on center.

C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.
    1. Install panels with manufacturer's recommended gap for panel field and corner joints.
        a. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.
        b. Drive fasteners for snug fit. Do not over-tighten.

D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.
    1. All moldings must provide for a minimum 1/8 inch (3.18mm) of panel expansion at joints and edges, to insure proper installation.
    2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.03 CLEANING

A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.

B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION

SECTION 09 88 13

CONCRETE FLOOR SEALER

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Concrete floor sealer.

B. Related Sections
   1. Section 03 30 00 – Cast-In-Place Concrete.

1.02 SUBMITTALS

A. Submit manufacturer's specification for floor sealer and application requirements.

1.03 PRODUCT HANDLING

A. Deliver containers to project site in sealed, unopened, and labeled containers.

B. Store and handle to prevent damage to product and environment.

1.04 PRODUCT CONDITIONS

A. Assure concrete has been cured a minimum of 7 days.

B. Assure concrete is clean and free of curing compounds, sealers, laitance, grease, oil, and contaminants.

C. Protect adjacent areas from damage due to overspray.

PART 2 PRODUCTS

2.01 MATERIALS

A. **SL-1**: Concrete Sealer Densifier
   1. Color: Clear.
   2. Approved Manufacturers and Products:
      a. L & M Construction Chemicals, Inc.: Seal Hard.
      b. Sonneborn Building Products.
      c. Tennant Company: Eco-Hard-N-Seal™.
      d. Or approved equal.

PART 3 EXECUTION

3.01 APPLICATION

A. Apply sealer in accordance with manufacturer's specifications.

B. Thoroughly clean concrete surface before applying sealer.

C. Apply directly from sealer container onto concrete surface. Do not dilute.

D. Use mechanical walk-behind or riding scrubber.

E. Apply first application at a minimum rate of 1 gallon per 200 square feet.

F. Allow surfaces to remain wet with sealer for a minimum of 60 minutes.

G. Remove excess sealer at end of application procedure by water flushing and squeegeeing dry.

H. Apply second application of sealer just prior to project completion at the rate recommended by the manufacturer.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Surface preparation, materials, and application of protective coatings specified herein.
   2. Shop applied and field applied coatings.

B. Related Sections
   1. 03 30 00 – Cast-In-Place Concrete.
   2. 03 40 00 – Hollow Core Precast Concrete Planks.
   3. 04 22 00 – Concrete Unit Masonry.
   4. 05 50 00 – Metals Fabrications.
   5. 08 11 00 – Metal Doors and Frames.
   6. 09 29 00 – Gypsum Drywall.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. D4414 – "Standard Practice for Measurement of Wet Film Thickness by Notched Gauges."
   2. D4541 – "Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers."
   3. E-337 – "Test Method for Measuring Humidity by Psychrometer."
   4. F1869 – "Standard Method of Measuring Moisture Vapor Emission rate of Concrete Subfloor Using Anhydrous Calcium Chloride."
   5. Committee D01.23 – "Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Using Ultrasonic Gauge."

B. ICRI – International Concrete Repair Institute
   1. Technical Guideline No. 03372, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer overlays.

C. SSPC – The Society for Protective Coatings and NACE- The National Association of Corrosion Engineers – Surface Preparation Specifications. The current preparation standards are joint standards SSPC/NACE.
   1. SSPC-SP13/NACE No. 6, Surface Preparation of Concrete.
   2. NACE RPO188 "Discontinuity Holiday Testing of Protective Coatings."

D. Green Seal
   1. GC-03 – Anti-Corrosive Paints.
   2. GS-11 – Product Specific Environmental Requirements.

E. Painting and Decorating Contractors of America
   1. PDCA – Architectural Painting Specification Manual.

F. South Coast Air Quality Management District
   1. SCAQMD Rule 1113 – Architectural Coatings.

1.03 SUBMITTALS

A. Shop Drawings
   1. Furnish shop drawings in accordance with Section 01 33 00. Include data sheets for each paint system required, as well as color charts. Submit shop drawings of the proposed stencil lettering, arrows, and words to be provided.

B. Factory-Applied Coatings
   1. Submit to the Architect for review certified lab testing from manufacturer that the coating system meets or exceeds requirements specified within. Include product data sheets and testing information specified for submittals in Part 2 - Products.

1.04 WARRANTY

A. The Contractor and coating manufacturer shall warrant jointly and severally to the Owner and guarantee the Work under this Section against defective workmanship and materials for a period of 2 years commencing on the date of final acceptance of the Work.

1.05 QUALITY ASSURANCE

A. The paint products mentioned in the following Specification are set up as a standard of quality. The standard "or equal" clause shall apply. Requests for substitution shall include the name of the specified material for which a substitution is sought, the name of the proposed material, product data sheets, and certified lab testing for each of the criteria referenced below. Additional information may be requested by the Architect. No request for substitution shall be considered which would decrease film thickness or change the generic type of the coating specified. The decision of the Architect regarding approval or disapproval of the proposed substitution shall be final.
   1. Performance Criteria to be referenced for each product shall include:
      a. Abrasion – ASTM D4060, CS-17 Wheel, 1,000-grams load.
      b. Adhesion – ASTM D4541.
      c. Hardness – ASTM D3363.
      d. Humidity – ASTM D2247 and D4585.
      e. Salt (Fog) Spray – ASTM B117.
      f. Corrosion Weathering – ASTM D5894.

B. Experience: Contractor must have performed satisfactory installation of protective coatings systems in wastewater treatment facilities and shall have 5 years of practical experience in the application of specified products. Upon request, Contractor shall substantiate this requirement by furnishing a list of references and job completions. In lieu of experience, the Contractor shall provide a guaranty bond or cash deposit equivalent to 100 percent of the Painting Bid Price to guarantee performance. The Contractor shall submit documentation from the manufacturer that he has successfully completed training or obtained certification on the use of the product systems specified herein.

C. A minimum of 30 days prior to the start of any painting, Contractor shall schedule a meeting held at the Site with the manufacturer's representative, painting contractor, Contractor, the Owner, and the Architect. Items discussed will be application, surface preparation, environmental control, coordination, paint properties, safety, quality assurance measures, etc.

D. Coating manufacturer shall provide a qualified representative to visit the Site as required for quality assurance and to determine compliance with manufacturer's instructions and this Specification. The Architect may require a manufacturer's representative to resolve field problems pertaining to products furnished under this Contract.

E. Inspection by the Architect or the waiver of inspection of any particular portion of the Work shall not be construed to relieve the Contractor of his or her responsibility to perform the Work in accordance with these Specifications. Owner reserves the right to hire a third-party inspector if deemed necessary. Inspector(s) shall have full access to all areas of Work.

F. Contractor shall complete documentation of quality assurance for the Project. Documentation shall be available to Owner/Architect for periodic analysis throughout the Project and submitted to Owner/Architect as a complete package prior to construction completion. Among the minimum items that should be included as part of this quality assurance is
   1. Documentation that preparation procedures meet the standard specified for each system.
   2. Documentation of mil thickness of each coat as it applies to this Specification.
   3. Visually inspect and document coatings especially linings for un-cured resin, bubbles, pinholes, fisheyes, checking and foreign debris. Then mark and repair these areas.
   4. Test for holidays in immersion areas by use of a holiday detector system.
   5. Note: At Contractors' option, he or she may elect to have this done by a third-party inspector at the Contractors expense.

1.06 SURFACES REQUIRED TO BE PAINTED

A. It is the intent that all new interior exposed surfaces of metal, precast concrete planks, precast concrete wall panels, concrete, concrete masonry units without integral coloring, gypsum drywall, sheet metal, process equipment, HVAC equipment, electrical equipment, process piping, plumbing, sanitary piping, wood, and other miscellaneous items be painted, whether specifically mentioned or not, unless indicated otherwise.

1.07 SURFACES NOT REQUIRED TO BE PAINTED

A. Non-ferrous and corrosion-resistant ferrous alloys, such as copper, bronze, monel, aluminum, chromium plate, stainless steel, factory finished metal roofing, metal facing panels, metal soffits, plus fiberglass, **except** as noted below. Therefore, paint the following:
   1. Where required for electrical insulation between dissimilar metals.
   2. Aluminum in contact with concrete or masonry.
   3. All electrical conduit.
   4. Vents, grills, and louvers that are not prefinished.
   5. Aluminum ductwork.
   6. Copper water and drainage piping systems, including accessories.

B. The following surfaces shall not be painted
   1. All HVAC machinery, vents, grills, and louvers that are anodized or factory finished with baked enamel.
   2. Non-metallic materials, such as glass and porcelain, except as required for Architectural painting or color-coding.
   3. Electrical motor control and supervisory panels furnished with baked enamel finish or specified not to be painted.
   4. Non-exposed galvanized steel surfaces, such as conduit above suspended ceilings.

5. Anodized aluminum doors, door frames, and windows.
6. Sprinkler heads.
7. Interior concrete or concrete block walls and ceilings above suspended ceilings.
8. Finish materials with inherent color.
9. Caulking: Pre-colored caulking shall be provided.
10. Surfaces below grade that will be covered with soil.

1.08 COORDINATION AND SCHEDULING

A. Painting shall be done at such times as agreed upon by the Contractor and Architect in order that neat, dust-free work is obtained. All painting shall be done strictly in accordance with the manufacturers' instructions and shall be performed in a manner satisfactory to the Architect.

B. Contractor shall strictly adhere to the temperature, dew point, relative humidity, and any other requirements specified on the manufacturer's product data sheets. All heating units shall be indirect-fired and explosion proofed. No open flame heaters may be used during application or curing of coatings. All combustion by-products shall be positively vented to the outside.

C. Conform to the requirements of Division 01.

D. Painting of all steel door tops and bottoms shall be completed prior to hanging of the doors. If this does not occur, all steel doors will be taken off their hinges and laid flat for painting of the tops and bottoms.

E. Damage to painted surfaces incurred during construction shall be repainted by the Contractor at no cost to the OWNER.

F. General Contractor shall coordinate with painting subcontractor, paint supplier, and equipment and material suppliers that factory applied coatings are compatible with final coatings of proposed manufacturers of this Section.

G. Protection
1. Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.

1.09 PAINT DELIVERY AND STORAGE

A. All materials shall be delivered to the Site in the original sealed and labeled containers and shall be subject to inspection by the Architect. All labels shall show the name of the manufacturer, general type of paint, batch date or number, color name or number, and trade name and number identifying each specific product.

B. All materials used on the Project by the Contractor shall be stored in a single place provided by the Contractor or designated by the Architect. Such storage shall comply with OSHA Requirements and the recommendations of the National Fire Protection Association. Product data safety sheets shall be kept on Site at all times.

C. Oily or solvent-soaked rags and all waste shall be removed every night and all necessary precautions shall be taken to reduce fire hazard to a minimum.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Paints, Coatings, Linings, Sealers, and Stains
   1. Tnemec (Standard of Quality). Note, that Series 20 or FC 20 may be substituted for Series N69 or N69F, but Series N69 or N69F shall not be substituted for Series 20 or FC 20.
   2. Equivalent products by Sherwin Williams.
   3. Bid other manufacturers as Substitute items.

B. Latex Paint
   1. The Sherwin Williams Company (Standard of Quality).
   2. Equivalent products by Tnemec, Benjamin Moore, or Ameron.

2.02 COLORS

A. All colored products shall be assumed to be tinted, unless stated otherwise.

B. Room finish colors shall be selected by Owner.

C. The Architect shall select colors from manufacturers' standard and special OHSA safety color guide.

D. Interior room colors shall be selected by the Owner and may be a different color in each room. Ceilings and floors may be different colors than walls and there may be up to 2 wall colors in each area.

E. The Contractor shall submit color charts to the Architect and Owner and obtain an approved color schedule for all coatings prior to application.

2.03 MATERIALS

A. The specified products are the standard of quality.

B. All unspecified materials, such as shellac, turpentine, or linseed oil, shall be the "best grade" or "first line" product made by a reputable recognized manufacturer.

C. All materials applied to the same surface shall be compatible.

D. Materials shall be ready-mixed, except for tinting of under coats and possible thinning (if recommended by the manufacturer).

E. Indoor Environmental Quality Characteristics
   1. [Interior] Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
   2. [Interior] Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.
   3. [Interior] Clear Wood Finishes, Floor Coatings, Stains, Primers, and Shellacs: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113.
   4. [Interior] Concrete, Wood, Bamboo, and Cork Floor Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113, including sealers and stains.

2.04 PIPE IDENTIFICATION

A. All exposed interior and exterior piping having diameters 6 inches or larger shall receive stencil type painted identification utilizing coating FM-2 of Section 3.04. Piping smaller than 6 inches shall receive pipe markers per Section 40 05 10 or Section 22 05 00.

B. Stencils shall be constructed of flexible plastic and shall be re-usable.

C. Stencil letters shall be upper case, 2 inches in height, and proportional in width.

D. Stencils shall identify process or fluid conveyed and direction of flow.

E. Each pipe identification stencil shall be constructed so that all letters and words contained in the identifying label are wholly complete and properly spaced. No combination of differently worded stencils shall be allowed to identify any 1 pipe.

F. Each stencil shall have a 6-inch long by 1-inch wide direction of flow arrow included before and after the identifying words. The arrow on the left shall point left and the arrow on the right shall point right. When the stencil is painted on the pipe, the arrow indicating proper direction of flow shall also be painted while the other arrow shall be covered up.

G. Stencils shall be cleaned and turned over to the Owner after all painting is complete.

H. For Bidding purposes, assume 10 different stencils each having 2 arrows and 20 letters each.

I. A drawing and description of a typical stencil shall be submitted to the Engineer for approval and at that time a list will be provided of all stencils required.

J. Placement
   1. Each pipe shall be labeled with a minimum of 2 stencils in each room.
   2. Stencils shall be applied on all branch lines of all header pipes.
   3. Stencils shall be installed on all header lines between branches.
   4. Where the same pipe goes through a wall or a piece of equipment, stencils on each side are required.
   5. Stencils for chemical piping shall in no case exceed 10-foot spacing.
   6. In no case on all other piping shall stencils exceed 20-foot spacing.

PART 3 EXECUTION

3.01 GENERAL SURFACE PREPARATION

A. All surfaces to be painted shall be prepared with the objective of obtaining the cleanliness and profile required for the specified coating system and intended service environment. No painting shall be done before the prepared surfaces are approved by the Architect. Approval by the Architect does not relieve the Contractor of responsibility to meet all requirements of Specifications, paint manufacturer requirements/recommendations, rework as required, etc.

B. Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on valves and machinery, and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring any adjacent surfaces. Protect working parts of

all mechanical and electrical equipment from damage during surface preparation and painting process. All openings in motors shall be masked to prevent paint and all other materials from entering the motors.

C. Perform preparation procedures for each substrate in strict accordance with paint manufacturers written instructions and as outlined in the following schedule. Refer to the subsequent discussions for specific preparation requirements.
   1. S1: SSPC-SP1 Solvent Cleaning
      a. The removal of all visible oil, grease, soil, drawing, and cutting compounds, and other soluble contaminants from surfaces with solvents or commercial cleaners using various methods of cleaning, such as wiping, dipping, steam cleaning, or vapor degreasing.
   2. S2: SSPC-SP2 Hand Tool Cleaning
      a. The removal of all loose mill scale, loose rust, loose paint, and other loose detrimental foreign matter by the use of non-power hand tools.
   3. S3: SSPC-SP3 Power Tool Cleaning
      a. The removal of all loose mill scale, loose rust, loose paint, and other loose detrimental foreign matter by the use of power-assisted hand tools.
   4. S4: SSPC-WJ4 Light Water Jetting (Pressure Wash)
      a. The entire surface shall high pressure washed at a minimum 1,500 psi removing all loose paint, dirt, or foreign matter. Upon completion of pressure washing procedure, rinse all areas with potable water and allow to dry. Dryness of surface shall be verified by use of polyethylene moisture test or a reading of 17 percent or less utilizing a moisture meter.
   5. S5: Concrete/Gypsum
      a. Prepare cementitious surfaces of concrete, concrete block, cement plaster, and mineral fiber board to be painted by removing all efflorescence, chalk, dust, laitance, dirt, grease, oils, and by roughening as required to remove glaze. Scrape and grind fins and protrusions flush with surface. Rake mortar joints clean.
   6. S6: SSPC-SP6 or NACE 3 Commercial Blast Cleaning
      a. The removal of all visible oil, grease, dirt, dust, mill scale rust, paint, oxides, corrosion products, and other foreign matter by compressed air nozzle blasting, centrifugal wheels, or other specified method. Discoloration caused by certain stains shall be limited to no more than 33 percent of each square foot of surface area. The blast profile specified by the coating manufacturer's product requirements shall be achieved.
   7. S7: SSPC-SP7 or NACE 4 Brush-Off Blast Cleaning.
      a. The removal of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint by compressed air nozzle blasting, centrifugal wheels, or other specific method. Tightly adherent mill scale, rust, and paint may remain on the surface.
   8. S8: SSPC-WJ4 Light Waterjetting (High Pressure Wash)
      a. The entire surface shall be high pressure (minimum 2,500 psi) washed with a biodegradable, phosphate, and residue free additive. A stiff bristle brush shall be used to assist in the removal of all dirt, mildew, dust, and other foreign matter.
   9. S9: SSPC-SP13 Acid Etching
      a. Remove residual dust and dirt with water using a high-pressure hose. Remove excess water and allow concrete to dry until the surface is damp. Uniformly apply a solution of 1-part Muriatic Acid and 2 to 4 parts fresh water utilizing low pressure spray equipment or sprinkling cans. When bubbling begins to subside, immediately rinse with clean water while scrubbing with a stiff bristle broom. Test with pH paper and continue the rinsing operation until a pH of 7 or higher is obtained. Allow floor to dry thoroughly before coating.

10. S10: SSPC-SP10 or NACE 2 Near-White Metal Blast Cleaning
    a. The removal of all visible oil, grease, dirt, dust, mill scale rust, paint, oxides, corrosion products, and other foreign matter by compressed air nozzle blasting, centrifugal wheels, or other specified method. Discoloration caused by certain stains shall be limited to no more than 5 percent of each square inch of surface area. The blast profile required by the coating manufacturer's product requirements shall be achieved.
11. S11: Concrete (Severe Exposure, Including Immersion)
    a. SSPC-SP13/NACE No. 6 and ICRI Guideline No. 310.2 according to manufacturer's recommendations:
        1) Abrasive blast all surfaces to remove all laitance and solid contaminants. Blasting shall be performed sufficiently close to the surface so as to open up surface voids, bug holes, air pockets, and other subsurface irregularities.
12. SSPC-SP11 Power Tool Cleaning to Bare Metal
    a. Removal of all visible oil, grease, dirt, mill scale, rust, paint, oxide, corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portion of pits if the original surface is pitted.

D. Cast-In-Place Concrete, Precast Concrete, and Concrete Block
1. All surfaces shall be cleaned or any loose scale, cement, form oil, curing compounds, dirt, or other deleterious material.
2. Concrete Masonry Unites
    a. Mortar joints cured 28 days.
    b. Substrate must be clean and dry, and free of all contaminants, including laitance.
    c. Tooled joints shall be brushed to remove pieces of mortar and other foreign matter.
    d. Chipped block shall be patched with concrete patching materials prior to application of paint coatings.
    e. All holes or chips shall be carefully filled and properly repaired prior to painting.
3. Poured-In-Place and Precast Concrete
    a. Allow 28 days for concrete to cure.
    b. Substrate must be clean and dry, and free of all contaminants, including form release agents and laitance.
    c. Roughen surface to create a profile capable of supporting the coating system specified.
    d. All concrete for immersion service shall be prepared per SSPC-SP13/NACE No. 6 or ICRI Guideline 310.2.
    e. All concrete for immersion service shall have successfully passed the leak testing requirements of this Project prior to application of paint coatings.

E. Wood Surfaces
1. Wood surfaces shall be thoroughly cleaned and free of all matter with cracks, nail holes, and other defects properly filled and smoothed or cleaned, smooth and dust free.
2. Prior to the application of any stain, the wood surfaces must be thoroughly sanded to remove all mill marks and scratches.

F. Galvanized Steel
1. Immersion Service - SSPC-SP16 Brush Blast Abrasive sweep blast followed by SSPC-SP1 Solvent Cleaning.
2. Non-Immersion Service - Roughen surface to create a profile capable of supporting the specified system. Follow with SSPC-SP1 Solvent Cleaning.

G. Copper and Aluminum (Non-Submerged)
   1. Sand and follow with SSPC-SP1 Solvent Cleaning, apply coating within 8 hours, or before an oxide layer can form.

H. Pipe Insulation, Interior Rigid, and Interior Semi-Rigid Insulation
   1. Substrate must be clean and dry, and free of oil, grease, and other contaminants.

I. Valves
   1. All shop primed valves shall be solvent cleaned in accordance with SSPC-SP1 solvent cleaning to remove grease and oil prior to field painting.

J. PVC, RTRP and Other Non-Metal Piping
   1. Sand and solvent wash with clean rags and MEK.

3.02 PRIMING

A. Shop Priming: All steel and iron surfaces shall receive the following:
   1. Surface Preparation
      a. NAPF 500-03-04
         1) Exterior of submerged and non-submerged ductile iron piping, fittings, and appurtenances: NAPF 500-03-04, surface profile of 2.0 to 3.0 mils.
   2. Coating
      a. Tnemec 161, Sherwin-Williams Macropoxy 646, or equal. 3.0 to 5.0 mils dry film thickness. Color shall be Tnemec 1255 Beige or equivalent.
   3. Whenever the shop priming coat has been damaged in transit or during construction, the metal shall be spot cleaned in accordance with the specified surface preparation and touched-up. Where the steel is delivered to the Site unprimed, it shall receive surface preparation and prime coating as required above.

B. Field Priming: Non-ferrous and Galvanized Metals.
   1. Surface Preparation
      a. SSPC-SP16 Brush Off Blast cleaning of Non-Ferrous Metals: Brush blast and clean entire surface to be coated to roughen substrate and remove contaminants.
   2. Coating
      a. Tnemec 161, Sherwin-Williams Macropoxy 646, or equal. 3.0 to 5.0 mils dry film thickness. Color shall be Tnemec 1255 Beige or equivalent.

3.03 PAINT APPLICATION

A. Apply each coat at the rate specified for application by the manufacturer. All dry film thickness requirements must be met per this specification regardless of brush roll or spray application. Brush and Roller applications may require additional coats to meet the minimum requirement for each coat in each system.

B. Stripe coat each coat onto bolts, edges, irregularities, welds, corners, joints, etc. by brush, in addition to spray application.

C. Curing time shall not be determined by average curing time under ideal laboratory conditions. Drying time shall be construed to mean “under normal conditions.” Temperature, relative humidity, and other environmental factors must be observed. Where conditions are other than normal because of the weather or because painting must be done in confined spaces, longer curing and drying times will be necessary. Additional coats of material shall not be applied over previously applied coats until those coats are

adequately cured and thoroughly dried. Units shall not be placed in service until coatings are properly cured and thoroughly dry.

D. Where thinning is necessary, only the products of the manufacturer furnishing the paint for that particular purpose shall be accepted and all such thinning shall be done strictly in accordance with the manufacturers' instructions as well as with the full knowledge and approval of the Architect.

E. Protection of Materials Not To Be Painted: Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, etc. and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring any adjacent surfaces. Protect working parts of all mechanical and electrical equipment from damage during surface preparation and painting process. All openings in motors shall be masked to prevent paint and all other materials from entering the motors.

F. Paint shall not be applied in extreme heat, temperatures below or above manufacturer's recommendation as listed on the product data sheet, nor in dust, smoke-laden atmosphere, and damp or humid weather. Apply paint in strict accordance with all product data sheet recommendations.

G. Abrasive blast cleaning shall not be performed whenever the relative humidity exceeds 85 percent, nor whenever the surface temperature is less than 5 degrees F above the dew point of the ambient air. Coating manufacturer's recommendations are to be strictly adhered to. Blast cleaned surfaces shall be primed prior to any evidence of rust bloom.

H. Finish coats shall be uniform in color and sheen without streaks, laps, runs, sags, pinholes, missed areas, etc.

I. In the event heating devices are used, they shall be explosion-proof and of the type that do not exhaust moisture, sooty or oily residues or any other contaminants into the structure, tank, building, etc. Forced air electric heat or heat exchangers with all combustion products positively vented to the exterior is required.

J. Yellowing or any other discoloration of paint will be unacceptable and will require repainting at no additional expense to OWNER. Contractor shall be responsible to provide all ventilation, heating, etc. to provide proper curing for painting and to prevent discoloration.

3.04 COATING SCHEDULE

A. The following surfaces shall receive the surface preparation described in Article 3.01 and the product mentioned below. Prime, intermediate, and finish coats shall be of noticeably different, but compatible colors.

FM-1 Interior Metal Doors and Frames, and Metal Window Frames.

a. Surface Preparation: S1 thru S4 as necessary based on condition of metal.
b. Shop/Field Primer: Sherwin-Williams - Kem Bond HS at 2.5 to 3.5 mils DFT.
c. Intermediate Coat: Sherwin-Williams Steel-Master 9500 Enamel at 2.0 to 3.0 mils DFT.
d. Finish Coat: Sherwin-Williams Steel-Master 9500 Enamel at 2.0 to 3.0 mils DFT.
e. Total DFT: 6.5 to 9.5 mils.

FM-2 Ferrous Metals – Exterior Exposure, including Exterior of all Outside Metal Doors and Frames:

a. Surface Preparation: S1 thru S4 or S6 as necessary based on condition of metal.
b. Shop/Field Primer: Sherwin-Williams Macropoxy 646 Fast Cure Epoxy at 3.0 to 5.0 mils DFT.
c. Intermediate Coat: Sherwin-Williams Macropoxy 646 Fast Cure Epoxy at 2.0 to 4.0 mils DFT.
d. Finish Coat: Sherwin-Williams Acrolon 218 HS Polyurethane – Gloss at 3.0 to 5.0 mils DFT.
e. Total DFT: 8.0 to 14.0 mils.

GB-1 Gypsum Board – Epoxy Paint

a. 1 coat of PrepRite® 200 Latex Primer, B28, 1.2 mils DFT.
b. Finish: 2 coats Water Based Catalyzed Epoxy, B70, 1.5 mils DFT/coat.

GB-2 Gypsum Board - Paint

a. 1 coat of PrepRite® 200 Latex Primer, B28, 1.2 mils DFT.
b. Finish: 2 coats Pro Mar 200 Latex Egg Shell Enamel, B20, 1.5 mils DFT/coat.

M-1 Concrete or Brick Masonry Units - Interior Exposure.

a. Surface Preparation: S4 and S5.
b. 1 Coat of Kem Cati-Coat HS Epoxy Filler/Sealer, 10.0 to 20.0 mils DFT.
c. 2 Coats of Macropoxy 646 Fast Cure Epoxy at 4.0 to 8.0 mils DFT per coat.

M-2 Extruded Plank - Interior Exposure:

a. Surface Preparation: S4 and S5.
b. 1 Coat of Kem Cati-Coat HS Epoxy Filler/Sealer, 10.0 to 20.0 mils DFT.
c. 2 Coats of Macropoxy 646 Fast Cure Epoxy at 4.0 to 8.0 mils DFT per coat.

W-1 Wood – Interior Exposure – Epoxy Paint

a. Surface Preparation: S2.
b. 1 coat of Premium Wall and Wood Interior Latex Primer, B28, 1.6 mils DFT.
c. Finish: 2 coats Water Based Catalyzed Epoxy, B70, 1.5 mils DFT/coat.

W-2 Wood Surfaces – Interior Surfaces

a. 1 coat oil-based stain.
b. 3 coats waterborne polyurethane satin varnish.

MP-1 Metal Moving Parts – Chains, plates, gates, valves, and similar submerged and non-submerged moving parts

a. 1 coat of Koppers Inertol Grease Coating at 40 sq.ft./gal).

B. Ductwork and conduit exposed to view shall receive finish coatings the same color as walls and/or ceilings to which they are adjacent. Color selections to be made by Owner.

3.05 DAMAGED COATINGS

A. Damaged coatings and pinholes shall have the edges feathered and repaired in accordance with paint manufacturer's directions.

B. All finish coats, including touch-up and damage-repair coats, shall be applied in a manner that will present an appearance of uniform color and texture.

3.06 UNSATISFACTORY APPLICATION

A. If the item has an improper finish color or insufficient film thickness, the surface shall be cleaned and topcoated with the specified paint material to obtain the specified color and coverage. Specific surface preparation information shall be obtained from the paint manufacturer and the Architect.

B. All visible areas of chipped, peeled, or abraded paint shall be hand or power sanded feathering the edges. The areas shall be primed and finish coated in accordance with the Specifications. Depending on the extent of repair and its appearance, a finish sanding and topcoat may be required by the Architect.

C. Work shall be free of runs, bridges, shiners, laps, or other imperfections. Evidence of the conditions is grounds for rejection.

D. Any defects in the coating system shall be repaired by the Contractor per written recommendations of the coating manufacturer.

3.07 CLEANUP

A. All rags and waste that may be constituted a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work all staging, scaffolding, and containers shall be removed from the Site or destroyed in a legal manner. Paint spots, oil, or stains upon adjacent surfaces and floors shall be completely removed and the entire Site left clean and acceptable to the Architect.

END OF SECTION

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SECTION 10 14 00

SIGNS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Plastic interior signs.
   2. Exterior room signs.

1.02 SUBMITTALS

A. Two samples of each sign material.

B. Complete sample sets of colors and finishes available for Section by Owner.

PART 2 PRODUCTS

2.01 PLASTIC ROOM SIGNS

A. Manufacturers and Products:
   1. Best Sign Systems: Graphic Blast FG (Standard of Quality).
   2. Sign Solutions Inc.
   3. Comparable products from other approved manufacturers.

B. Letters: Raised 1/32-inch, upper case, sans serif accompanied with Grade 2 braille.

C. Mounting: Stainless steel vandal-resistant screws with stainless steel expansion anchors (4 per sign minimum).

D. Color
   1. Core color to be selected by the Owner.
   2. Face color to be selected by the Owner.

E. Size and Quantity of Signs as Listed Below:
   1. Room Identification Signs - Provide the following room identification signs with 1-inch high letters and sign size (4-3/4-inch by 6-inch minimum):
      a. RECEPTIONIST (Quantity 2 – One at Door 104-1 and One at Door 104-2).
      b. CONFERENCE ROOM (Quantity 1 – At Door 107-1).
      c. OFFICE (Quantity 8 – One at Door 108-1, One at Door 109-1, One at Door 112-1, One at Door 116-1, One at Door 117-1, One at Door 118-1, One at Door 121-1, and One at Door 123-1).
      d. CITY OFFICES (Quantity 1 – At Door 114-1).
      e. STORAGE (Quantity 1 – At Door 145-1).
      f. STORAGE (Quantity 1 – At Door 201-1).
      g. MAXIMUM LIVE LOAD: 150 PSF (Quantity 2 – One on west wall of Room 203 and One on east wall of Room 203).
      h. OFFICE (Quantity 1 – At Door 205-1).
      i. PLAN STORAGE (Quantity 1 – At Door 206-1).

2.02 EXTERIOR ROOM SIGNS

A. Manufacturers and Products:
   1. ADA Sign Factory, MetalGraph Brushed Aluminum signs (Standard of Quality).
   2. Best Manufacturing Standard Sign Systems.
   3. Sign Solutions SR Series.
   4. Comparable products from other approved manufacturers.

B. Letters: Raised 1/32-inch, upper case, sans serif accompanied with Grade 2 braille.

C. Mounting: Countersunk stainless-steel vandal-resistant screws at each corner into stainless steel expansion shields drilled into precast concrete wall panels with 1 inch minimum embedment.

D. Color
   1. Black text and graphics.
   2. Brushed aluminum acrylic sign.

E. Size and Quantity of Signs as Listed Below:
   1. Room Identification Signs - Provide the following room identification signs with 5/8 inch high letters and sign size (4-3/4-inch by 6-inch minimum):
      a. VEHICLE PARKING (Quantity 1 – At Door 143-1).
      b. GARAGE/SOIL STORAGE (Quantity 1 – At Door B101-1).

PART 3 EXECUTION

3.01 INSTALLATION

A. Field-verify surface conditions before installing signs. If surfaces are unsuitable for the fastener type specified, notify Architect in writing before proceeding with the installation.

B. All signs must be securely installed plumb, level, and in the proper location.

C. Review locations with Architect prior to installation.

END OF SECTION

SECTION 10 22 26

OPERABLE PARTITIONS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Manually operated, paired panel operable partitions.

B. Related Sections:
   1. 03 30 00 – Cast-In-Place Concrete.
   2. 05 50 00 – Metal Fabrications.
   3. 06 10 00 – Rough Carpentry.
   4. 09 29 00 – Gypsum Drywall.

1.02 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.

B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure and classified in accordance with ASTM E413 to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.

C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 *Standard Practice for Architectural Application and Installation of Operable Partitions*.

D. The operable wall must be manufactured by a certified ISO-9001-2015 company or an equivalent quality control system.

1.03 REFERENCE STANDARDS

A. ASTM International
   1. ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
   2. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
   3. ASTM C1036 - Standard Specification for Flat Glass.
   4. ASTM C1048 - Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass.
   5. ASTM E84 - Surface Burning Characteristics of Building Materials.
   6. ASTM E413 - Classification for Rating Sound Insulation

B. Health Product Declaration Collaborative
   1. Health Product Declaration Open Standard v2.1

C. International Standards Organization
   1. ISO 14021 - Environmental Labels and Declarations - Self-Declared Environmental Claims (Type II Environmental Labeling).
   2. ISO 14025:2011-10, Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.
   3. ISO 14040:2009-11, Environmental Management - Life Cycle Assessment - Principles and Framework.
   4. ISO 14044:2006-10, Environmental Management - Life Cycle Assessment - Requirements and Guidelines.
   5. ISO 21930 – Sustainability in Buildings and Civil Engineering Works — Core Rules for Environmental Product Declarations of Construction Products and Services.

D. Other Standards
   1. ADA – Americans with Disabilities Act.
   2. ANSI Z97.1 - Safety Glazing Materials Used in Buildings.
   3. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
   4. NEMA LD3 - High Pressure Decorative Laminates.

1.04 SUBMITTALS

A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.

B. Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.

C. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.

D. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.

E. Reports: Provide a complete and unedited written sound test report indicating test specimen matches product as submitted.

F. Create spaces that are healthy for occupants.
   1. Furnish products and materials with Health Product Declaration (HPD), Manufacturer Inventory, or other material health disclosure documentation. Products without an HPD or other disclosure documentation are not acceptable.

G. Furnish materials that generate the least amount of pollution.
   1. Furnish products and materials that have third party verified environmental product declarations (EPD's). Consider products and materials that have optimized environmental performance (reduced life cycle impacts). Products without an EPD or other disclosure documentation are not acceptable.

H. Buy American: Operable partition to be manufactured in the United States in compliance with applicable U.S. Federal Trade Commission (FTC) and U.S. Customs Service and Border Protections regulations and be labeled “Made in America”.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.

B. Protect panels during delivery, storage, and handling to comply with manufacturer’s direction and as required to prevent damage.

1.06 WARRANTY

A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.

B. Warranty period: Two (2) years.

PART 2 PRODUCTS

2.01 MANUFACTURERS, PRODUCTS, AND OPERATION

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Modernfold, Inc.

B. Panels to be manufactured in the U.S.A.

C. Products: Subject to compliance with the requirements, provide the following product:
   1. Acousti-Seal Premier – Paired Panel (932): Manually operated paired panel operable partition.

2.02 OPERATION

A. Acousti-Seal Premier – Paired Panel (932): Series of paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals.

B. Final Closure:
   1. Horizontally expanding panel edge with removable crank

2.03 PANEL CONSTRUCTION

A. Nominal 3-inch (76mm) thick panels in manufacturer’s standard 48-inch (1220mm) widths. All panel horizontal and vertical framing members fabricated from minimum 18-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.

B. Panel Skin Options:
   1. 1/2-inch (13mm) tackable 100% recycled gypsum board, class "A" rated single material or composite layers continuously bonded to panel frame. Acoustical ratings of panels with this construction (select one):
      a. 50 STC

C. Hinges for Closure Panels, Pass Doors, and Pocket Doors shall be:
   1. Full leaf butt hinges, attached directly to panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.

D. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.

E. Panel Weights:
   1. 50 STC - 8 lbs./square foot

2.04 PANEL FINISHES

A. Panel face finish shall be (select as required):
   1. Reinforced heavy-duty vinyl with woven backing weighing not less than 30 ounces (850 g) per lineal yard.

B. Panel trim: No exposed panel trim required or allowed; seals and hardware to be of one color.
   1. Smoke Gray

2.05 SOUND SEALS

A. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic or aluminum astragals or astragals in only one panel edge are not acceptable.

B. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.

C. Horizontal Bottom Seals (select one):
   1. A2 - Automatic operable seals providing nominal 2-inch (51 mm) operating clearance with an operating range of +1/2-inch (13mm) to –1-1/2 inch (38 mm) which automatically drop as panels are positioned, without the need for tools or cranks.

2.06 SUSPENSION SYSTEM

A. #14 Suspension System
   1. Suspension Tracks: Minimum 7-gage, 0.18-inch (5 mm) roll formed steel. Track shall be supported by adjustable steel hanger brackets connected to structural support pairs of 1/2-inch (13mm) diameter threaded rods. Brackets must support the load bearing surface of the track.
      a. Exposed track soffit: Steel, removable for service and maintenance, attached to track bracket without exposed fasteners, and pre-painted off-white.

2. Carriers: One all steel trolley with steel-tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.
3. Warranty period: Twenty (20) years.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.

B. Install operable partitions and accessories after other finishing operations, including painting have been completed.

C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

3.02 CLEANING AND PROTECTION

A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and Installer that ensure operable partitions are without damage or deterioration at time of Substantial Completion.

3.03 ADJUSTING

A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.04 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.05 DEMONSTRATION

A. Demonstrate proper operation and maintenance procedures to Owner's representative.

B. Provide Operation and Maintenance Manual to Owner's representative.

END OF SECTION

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SECTION 10 26 00

STAINLESS STEEL CORNER GUARDS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Corner guard system for wall protection:

B. Related Sections
   1. 09 29 00 – Gypsum Drywall.

1.02 SUBMITTALS

A. Product data for each type of corner guard specified.

B. Detail drawings indicating mounting details with the appropriate fasteners for specific project substrates.

C. Samples for verification purposes of corner guard, 6" (152mm) long, in full size profiles of each type and color indicated.

D. Cleaning and maintenance instructions for door and wall protection systems.

1.03 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened factory packaging to the jobsite and store in original packaging in a climate-controlled location away from direct sunlight.

1.04 PROJECT CONDITIONS

A. Products must be installed in an interior climate-controlled environment.

1.05 WARRANTY

A. Standard IPC Limited Lifetime Warranty against material and manufacturing defects.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer: IPC Door and Wall Protection Systems, InPro Corporation, PO Box 406 Muskego, WI 53150 USA; Telephone: 800-222-5556, Fax: 888-715-8407, Internet address: http://www.inprocorp.com

B. Substitutions: Per requirements of 01 60 00 – Product Requirements.

C. Provide all corner guards and wall protection from a single source.

2.02 MANUFACTURED UNITS

A. Corner Guards
   1. SS Corner Guards: Model, Size, Attachment Method, Grade, Thickness
      a. **CG-1:** SAS-1824H-304, 2"(51mm) x 2"(51mm) x 48"(1.21m), 1/8" radius, Screw-on, 304 Stainless Steel, 16 gauge.
      b. **CG-2:** SAS-183124H-304, 3½"(89mm) x 3½"(89mm) x 48”(1.21m), 1/8” radius, Screw-on, 304 Stainless Steel, 16 gauge.

2.03 MATERIALS

A. Stainless Steel: Corner Guards shall be manufactured from Type 304 (meets NSF Standard 51), 16 gauge Stainless Steel.

2.04 COMPONENTS

A. Attachment
   1. Fasteners: Pre-drilled beveled holes and Phillips head stainless steel screws.

2.05 FINISHES

A. Stainless steel: No. 4 satin finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions in which the corner guard systems will be installed.
   1. Complete all finishing operations, including painting, before beginning installation of corner guards.

B. Wall surface shall be dry and free from dirt, grease, and loose paint.

3.02 PREPARATION

A. General: Prior to installation, clean substrate to remove dust, debris, and loose particles.

3.03 INSTALLATION

A. General: Locate the corner guard as indicated on the approved detail drawing for the appropriate substrate and in compliance with the IPC installation instructions. Install corner guard level and plumb at the height indicated on the drawings.

B. Installation of Stainless Steel Corner Guards:
   1. Surface must be dry, clean and properly sealed.
   2. Screw on: Position the corner guard on the wall and attach it using the supplied screws.
   3. Remove the protective plastic covering from the exposed surface of the corner guard.

3.04 CLEANING

A. At completion of the installation, clean surfaces in accordance with the IPC clean up and maintenance instructions.

END OF SECTION

SECTION 10 26 41

BULLET RESISTANT PANELS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Bullet resistant fiberglass panels of the following ballistic rating level:
      a. ArmorCore Level 3.

B. Related Sections:
   1. 09 29 00 – Gypsum Drywall.

1.02 REFERENCES

A. ASTM International (ASTM):

B. National Institute of Justice Ballistic Standards (NIJ):
   1. NIJ Standard 0108.01.

C. Small Business Administration (SBA):
   1. SBA Small Business Size Standard.

D. Underwriters Laboratories (UL):
   1. UL 752 Specifications and Ammunition, 11th Edition, Standard for Bullet Resisting Equipment published September 9, 2005, revised December 21, 2006.

E. The United States Department of State:
   1. The International Traffic in Arms Regulations (ITAR).

1.03 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Details of installation of bullet resistant fiberglass panels.

D. Certificates: Submit printed data to indicate compliance with following requirements.
   1. UL Listing Verification and UL752 Current Test Results as provided by Underwriters Laboratories.
   2. ASTM E 119.
   3. ASTM F 1233.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

1.04 QUALITY ASSURANCE

A. Sourcing: Panels manufactured in the United States of America with raw materials sourced from the U.S.A. for quality assurance purposes and to comply with any applicable "Buy American" provisions.

B. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

C. Installer Qualifications: Minimum 2 year experience installing similar products.

1.05 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Deliver materials to project with manufacturer's UL Listed labels intact and legible.

C. Handle material with care to prevent damage. Store materials inside under cover, stack flat and off the floor.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.08 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.09 WARRANTY

A. Provide manufacturer's standard limited warranty for materials and workmanship against defects for a period of ten years from the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: ArmorCore by Waco Composites, which is located at: P. O. Box 20008; Waco, TX 76702-0008; Toll Free Tel: 866-688-3088; Tel: 254-752-3622; Fax: 254-752-3634; Email: request info (sales@armorcore.com); Web: www.armorcore.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.02 BULLET RESISTANT PANELS (**BRP-1**)

A. General:
   1. Bullet Resistant Fiberglass Panels shall be "non-ricochet type" to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration.
   2. Bullet resistance of joints: Equal to that of the panel.

B. Product: Panels shall be fabricated of multiple layers of woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets as manufactured by Waco Composites.

C. Panel Product: ArmorCore Level 3.
   1. Panel Rating: UL752 Level 3.
   2. Armor Type: NIJ Standard 0108.01 - Type IIIa.
   3. Physical Characteristics: 7/16 inch (11.1 mm) thick, 4.8 lbs. per sq.ft. (23.4 kg per sq. m).
   4. Panel Size: Maximum size to limit number of seams.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Prior to starting installation, verify work of related trades required in contract documents and architectural drawings is complete to the point where work of this Section may properly commence.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

B. Reinforce joints with a back-up layer of bullet resistive material. Minimum width of reinforcing layer at joint shall be 4 inches (102 mm), centered on panel joints.

C. Install panels in accordance with manufacturer's printed recommendations and as required by contract documents.

D. Secure armor panels using screws, bolts, or an industrial adhesive.

E. Method of application shall install panels minimizing vulnerabilities by fitting tightly to adjacent surfaces including concrete floor slab, concrete roof slab, bullet resistive door frames, bullet resistive window frames, and other assemblies.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Toilet accessories.
   2. Building accessories.
   3. Fasteners, locks and keys, and related accessories.

B. Related Sections
   1. 06 10 00 – Rough Carpentry.
   2. 09 29 00 – Gypsum Drywall.
   3. 09 31 13 – Ceramic Tile.

1.02 REFERENCES

A. Americans with Disabilities Act (ADA)
   1. Standards: Americans with Disabilities Act Architectural Barrier Removal and Compliance Manual, based on Minnesota Accessibility Code Chapter 1341.

1.03 SUBMITTALS

A. Submit for the Architect's review:
   1. Product Data.
   2. Shop Drawings.
   3. Material samples if requested by Architect.
   4. Sample Warranties.

B. Submit for Owner's Use/Records:
   1. Certificate of Compliance for performance requirements.
   2. Operating and Maintenance Manuals.
   3. Keys.
   4. Executed Warranties.

1.04 QUALITY ASSURANCE

A. Mounting heights shall first comply with the applicable building code and secondly comply with the Americans with Disabilities Act, unless it conflicts with the building code for all handicap-related accessories.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original unopened protective packaging with legible manufacturer's identification.

B. Store materials in original protective packaging to prevent soiling, physical damage, or wetting.

C. Handle to prevent damage to finished surfaces.

D. Protection
   1. Maintain protective covers on all units until installation is complete.
   2. Remove protective covers at final clean-up of installation.

1.06 WARRANTY

A. Contractor, manufacturer, and installer shall warrant the finish of installed products for a period of 5 years from date of Substantial Completion against the conditions indicated below. Upon written notice from the Owner, they shall promptly and without inconvenience and cost to Owner correct said deficiencies.
   1. Warrant mirrors against deterioration of silver coating.
   2. Warrant chrome plating against peeling, flaking, or discoloration.
   3. Warrant stainless steel against rusting, staining, or discoloration.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. A & J Washroom Accessories.

B. American Specialties, Inc.

C. Bobrick Washroom Equipment, Inc.

D. Bradley Corporation.

E. Or Approved Equal.

F. Standard of Quality: The Construction Documents are based on the proprietary literature from Bradley Corporation. The Contractor may at its option use equivalent materials by one of the other specified acceptable manufacturers.

2.02 MANUFACTURED UNITS

A. Paper Towel Cabinet (**PTC-1**): Recessed combination towel cabinet and waste receptacle shall be fabricated of Type 304, 22-gauge stainless steel with architectural satin finish. Door of non-flexing construction, equipped with full length piano hinge and tumbler lock. Towel dispenser capacity 800 multi-fold or 600 C-fold towels. Waste container capacity 4.9 gallons; tumbler lock; approximately 56 inches high by 17 inches wide. For mounting in 4-inch wall. Provide vinyl liner for waste and equip steel waste container with hanger hooks for vinyl liner.
   1. Standard of Quality: Bradley Corporation: No. 235.

B. Paper Towel Cabinet (**PTC-2**): Surface mounted towel cabinet furnished by Owner, installed under this project.

C. Soap Dispenser: (**SDISP**) Surface mounted liquid soap dispenser shall be fabricated of 20-gauge satin finish stainless steel. Dispenser shall have completely concealed mounting, vandal-resistant filler hole cover and sight gauge. Push-in corrosion-resistant liquid soap valve. Capacity: 40 oz. liquid soap.
   1. Standard of Quality: Bradley Corporation: No. 6562.

D. Grab Bars (**GB-1X**): 1-1/2-inch diameter, stainless steel bars fabricated to have 1-1/2-inch clearance from mounting surface with concealed fastener mounting. Furnish with proper type of anchor for construction conditions and code required loads.
   1. Lengths:
      a. GB-1A: 18 inches.
      b. GB-1B: 36 inches.
      c. GB-1C: 42 inches.
      d. GB-1D: 18-1/8 inches by 33-1/8 inches horizontal two-wall shower grab bar.
   2. Standard of Quality: Bradley Corporation: No. 812.

E. Folding Shower Seat (**SS-1**): Folding stainless steel shower seat shall be fabricated of 16-gauge stainless steel with exposed surfaces in satin finish. Seat welded to 1 inch diameter, 18-gauge stainless steel tubing. Support leg locks into 16-gauge retaining bracket with bullet-type catch. Shower seat shall meet or exceed ADA guidelines.
   1. Standard of Quality: Bradley Corporation: No. 956-30.

F. Shower Curtain Rod (**SR-1**): 1-1/4 inch diameter 18-gauge stainless steel, seamless construction with exposed surfaces in architectural satin finish. 22-gauge stainless steel escutcheon plates shall be 1-piece drawn construction with exposed surfaces in architectural satin finish. Snap over flanges to conceal mounting screws.
   1. Standard of Quality: Bradley Corporation: No. 9539.

G. Shower Curtain (**SC-1**): Shower curtain shall be of 10-ounce nylon reinforced antimicrobial vinyl fabric, flameproof, stain resistant, self-deodorizing, furnished with aluminum grommets on 6-inch centers. All sides hemmed. Provide stainless steel curtain rings to suspend curtain from rod.
   1. Standard of Quality: Bradley Corporation: No. 9537.

H. Robe Hook (**RH-1**): Surface mounted hat and coat hook shall be fabricated of heavy gauge No. 4 satin finish stainless steel.
   1. Standard of Quality: Bradley Corporation: No. 9134.

I. Utility Shelf (**US-1**): Surface mounted utility shelf shall be fabricated of Type 304, 18-gauge stainless steel with satin finish. Hooks shall be of 16-gauge stainless steel. Holders shall be with spring activated rubber cams.
   1. Standard of Quality: Bradley Corporation: No. 9933.

J. Mirrors Glass: (**MIR-1**) Channel framed mirrors. 1/4-inch polished plate glass, triple-silvered, electro-plated with baked enamel backing. Guaranteed against silver spoilage for 15 years. Stainless steel channel frame with bright-annealed finish. Mitered corners. 18-gauge steel wall hanger with all-welded construction. Galvanized steel back plate with shock absorbing waterproof filter. Mirror sizes shall be 24 inches wide by 36 inches high unless otherwise indicated on the Drawings.
   1. Standard of Quality: Bradley Corporation: No. 781.

PART 3 EXECUTION

3.01 INSPECTION

A. Check with Architect for locations of all units prior to installation.

B. Check areas to receive surface mounted units for conditions that would affect quality and execution of work.

C. Verify spacing of plumbing fixtures that affect installation of accessories.

D. Do not begin installation of washroom accessories until surfaces are acceptable.

3.02 INSTALLATION

A. Install according to manufacturer's recommendations and comply with Barrier-Free requirements.

B. Drill holes to correct size and application that so that they are concealed by items, with 1/4-inch tolerance.

C. Mount surface mounted accessories to back up with toggle bolts, plumb and align.

D. Anchor grab bars to wall in such a way as to support 250 pounds for 5 minutes.

3.03 ADJUST AND CLEAN

A. Adjust accessories for proper operation.

B. After completion of installation, clean and polish all exposed surfaces.

C. Deliver instruction sheets to Owner.

END OF SECTION

SECTION 10 28 14

ADULT CHANGING STATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Adult Changing Stations, Adjustable Height:
      a. Adjustable-Height Adult-Changing Station (Koala Model KB3000-AHL)

B. Related Sections:
   1. 04 22 00 – Concrete Unit Masonry.
   2. 09 31 13 – Ceramic Tile.
   3. 26 00 00 – Electrical service installation.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets for each product specified, including the following.
   1. Installation instructions and recommendations, including templates and rough-in measurements.
   2. Storage and handling requirements and recommendations.
   3. Cleaning and maintenance instructions.

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide products manufactured by a company with a minimum of 5 years successful experience manufacturing similar products.

B. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.

C. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA, ICC A117.1 International Building Code (IBC), and state building code requirements as applicable.

D. Manufacturing Location: United Kingdom

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

1.05 WARRANTY

A. Manufacturer’s Warranties: Submit manufacturer’s standard 3 year warranty for materials and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Koala Kare Products, a Division of Bobrick, www.koalabear.com.

B. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 01 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years.

2.02 ADULT CHANGING STATIONS, HEIGHT-ADJUSTABLE **(ACS-1)**

A. Surface-Mounted Adjustable Height Changing Station:
   1. Basis of Design: Model KB3000-AHL as manufactured by Koala Kare Products, a Division of Bobrick.
   2. Powered-Height Adjustability: Changing surface shall electronically adjust from 12" (300mm) to 41" (1,041mm) from floor.
   3. Unit shall have two sets of built-in electronic controls for height adjustment. One located on face of wall cover and one on the front of changing surface.
   4. Weight Capacity: Tested to support up to 500 lbs. (227 kg.) static load.
   5. Changing Surface shall be polyethylene and meet IK10 standard for resistance to high impact and sharp objects.
   6. Back-Up Battery: Unit shall have a built-in backup battery system that allows for continuous operation in the event of a power interruption.
   7. Emergency Stop: Unit shall include a wall-mounted emergency stop to break power to actuator.
   8. Changing Surface shall be a minimum 75 ¼" (1,911mm) long, and 31 ½" (800mm) wide, and can be opened and closed with one-hand.
   9. Unit shall have a safety rail with a curved dip in the center for easier patient changing by caregiver. Safety rail rotates and locks under changing bed when in closed position.
   10. Unit shall withstand significant exposure to water without damage to electrical components. It shall include a grounded power cord and have a splash-proof control system. Electrical components and wiring shall not come in contact with station users or caregivers.
   11. Changing surface shall not have covered areas to help ensure cleanliness.
   12. Unit shall have ISO 60601-1 and -2 whole product certification.
   13. Durability: Cycle tested through range of motion 28,000 times at 500lbs. Stress tested to 100,000 cycles with 500lbs. bounce load test.
   14. Frame shall be constructed of 2" powder coated steel tubing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
   1. Verify wall blocking has been installed properly.
   2. Verify required electrical services have been installed properly.

3. Verify wall location does not interfere with door swings or use of fixtures.
4. Use fasteners and anchors suitable for wall substrate and project conditions.
5. Install units at location and height indicated on the drawings.
6. Install units level, plumb, and in proper relationship with adjacent construction.
7. Adjust for proper operation.

3.02 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before substantial completion.

END OF SECTION

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SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Fire extinguishers.

B. Related Sections
   1. Section 04 22 00 – Concrete Unit Masonry.
   2. Section 09 29 00 – Gypsum Drywall.

1.02 QUALITY ASSURANCE

A. Conform to NFPA 10 requirements for portable fire extinguishers.

B. Fire extinguishers and accessories by single manufacturer.

1.03 SUBMITTALS

A. Submittals and shop drawings in accordance with Section 01 33 00.

B. Manufacturer's data and catalog cuts.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Approved Manufacturers for Fire Extinguishers:
   1. J.L. Industries.
   2. Larsen's Manufacturing Company.

2.02 MATERIALS

A. Fire Extinguisher (**FE**): 10 lb., multi-purpose, dry chemical, UL Rating 4A-60B:C.

B. Wall Bracket: Larsen B-2 Series.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify fire extinguisher installation locations with Owner/Fire Chief before starting the Work.

B. Verify installation locations and mounting heights for the security key boxes with Owner/Fire Chief.

C. Verify servicing, charging, and tagging of all fire extinguishers before leaving Site.

3.02 INSTALLATION

A. Install according to manufacturer's directions.

B. Securely anchor wall brackets 48 inches above floor.

END OF SECTION

SECTION 10 51 16

HEAVY DUTY PERSONNEL LOCKERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. First Responder Series Heavy Duty Personnel Lockers, including the following:
      a. Single Tier Size:
         1) **LKR-1:** 24 inches wide by 24 inches deep by 73-inches high.
   2. Provide fasteners and anchorage devises to install lockers provided under this section.
   3. Provide metal filler panels to fill between banks of lockers and adjacent construction.
   4. Locker benches.

B. Related Sections
   1. 06 10 00 – Rough Carpentry.
   2. 09 29 00 – Gypsum Drywall.
   3. 09 31 13 – Ceramic Tile.

1.02 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.

B. Shop Drawings: Show lockers and benches in detail, method of installation, fillers, trim, base, and accessories. Include locker numbering sequence information.

C. Samples for verification: Submit one full-size locker sample for evaluation. Adherence to the specification is required. Locker submitted must meet specification regardless of manufacturer's standard product. Submit manufacturer's technical data and installation instructions for metal locker units.

D. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals specified in Division 1.

1.03 QUALITY ASSURANCE

A. Uniformity and Single Manufacturer Requirements: Provide each type of metal locker as produced by a single manufacturer, including necessary mounting accessories, fittings, and fastenings.

B. Installers Qualifications: Lockers to be installed by an experienced agent of the manufacturer.

C. Storage and Protection: Protect materials from damage during delivery, handling, storage, and installation.

1.04 WARRANTY

A. Locker manufacturer shall warrant the lockers for the lifetime use of the original purchaser from date of shipment. Warranty shall include all defects in material and workmanship, excluding finish, vandalism, and improper installation.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Do not deliver metal lockers until building is enclosed and ready for locker installation.

B. Storage and Protection. Protect materials from damage during delivery, handling, storage and installation.

PART 2 PRODUCTS

2.01 APPROVED LOCKER MANUFACTURERS

A. DeBourgh Manufacturing Company, Basis of Design, First Responder Series.

B. Lyon Angle Iron.

C. Art Metal Products.

2.02 LOCKER FABRICATION

A. Locker Construction
   1. Lockers to be welded unibody construction with exposed welds sanded smooth.
   2. No bolts, screws or rivets used in assembly of locker units. Bolts and screws are used to attach upper unit to drawer base and to attach doors to locker unit.
   3. Ship lockers set-up, ready to be anchored in place in accordance with manufacturer's instructions.

B. Body of Lockers
   1. Top and Bottom: constructed of 18 gauge domestic cold rolled sheet steel for maximum durability. Includes 4 gang electrical knockout at rear center of unit top.
   2. Exterior sides constructed of 18 gauge domestic cold rolled sheet steel for maximum durability.
   3. Backs: Solid sheet of 18 gauge cold rolled sheet steel welded to frames of sides and intermediate partitions with 4 inch on center supports for reconfigurable interior components.
   4. Sides and back to have 4 inch on center supports for reconfigurable interior components.
   5. Continuous Door Strike to have 5/8 inch strike on all four sides of door opening for a secure, sanitary and intrusion-free locker while door is in closed position.

C. Doors
   1. Doors are 16 gauge steel, formed outer panel with double bends on both sides and a single bend on top and bottom with 18 gauge steel formed stiffener panel.
   2. 18 gauge stiffener runs top to bottom between ventilation. Stiffener is securely welded to outer door to form a reinforced channel for additional strength and sound reduction when closing door. Stiffener panel to cover a minimum of 1/3 of the width of the door and 2/3 of the overall height.

D. Door Ventilation
   1. Louvered doors with six louvers at the bottom only of the formed door providing 7% ventilation per square inch of ventilated area.

E. Top Ventilation (OPTIONS)
   1. Tops to feature adjustable baffling system for measured air flow.
   2. Tops to feature

F. Bottom Ventilation
   1. Rear bottoms to feature rounded perforations at the rear of the top unit for air flow from the bottom of the drawer base.

G. Latching (OPTIONS)
   1. Sentry I Three-Point/Three-sided Cremone Latch with Facia
      a. Latching mechanism operated cremone style with an 11 gauge padlock hasp that will accept a built-in combination lock or a padlock.
      b. Latching rods, 3/8 inch diameter, engage top and bottom edge of locker frame. A 3/16 inch thick center latch engages door jamb.
      c. Rubber bumpers riveted to door stops for quiet operation.

H. Hinges
   1. 1-1/2 inch open x 16 gauge CRS continuous hinge welded to right side of the door and riveted to locker frame.

I. Self-Latching Drawer Base with Bench
   1. Drawer base top, bottom and sides to be constructed from 18 gauge CRS. Drawer base back and drawer to be constructed using 18 gauge CRS.
   2. Drawer base to have integral self latching mechanism which is triggered by the operation of the wardrobe door. Drawer to be locked whenever the wardrobe door is closed. Drawer base to be designed to accept field-installed mixed hardwood bench.
   3. Drawer base to be fully assembled and attached to locker bottom at the factory.
   4. (2) Each: Full extension ball bearing drawer glides rated at a minimum of 200 pounds.

J. Numbering
   1. Furnish each locker with black anodized laser-etched aluminum number plate.
   2. Locate number plate near center of each door.
   3. Owner to furnish numbering sequence.

K. Filler Panels: Manufacturer's standard fabricated from 18 gauge solid steel painted to match lockers

L. Finish
   1. Complete locker unit to be thoroughly cleaned, phosphatized, and sealed.
   2. Finish is baked, TGIC polyester powder coat with a minimum 2-3 mil thickness.
   3. Color: As selected from one of DeBourgh's 27 standard colors. Interior components to be DeBourgh Storm Gray unless otherwise specified.

2.03 LOCKER ACCESSORIES

A. 18" deep Sloped Top, 18 gauge, with triangular access for air flow, shipped loose for field installation. Sloped top to have built in option for ventilation into room or to be used as a channel to vent air through HVAC system.

B. Closed Base, 4" high, 14 gauge

C. Shelving
1. Full width shelf with 12"w x 15"d x 12"h security box and clothes rod assembly (not available on 18" wide model)
2. Full width perforated shelf
3. Side shelf 12"w x 17"d x 08"h
4. Side shelf 12"w x 17"d x 12"h
5. Side shelf 12"w x 17"d x 16"h
6. Full width 18 gauge shelf stop/lip
7. Security Drawer, 17.5"w x 17"d x 4.9"h
8. Security box, 12"w x 15"d x 12"h
9. Removable 10.5"w x 15"d boot tray for easy cleaning.
10. Body armor drying rack (drawer insert), 18 gauge fully perforated for lower drawer compartment.
11. Hooks to be ¼" diameter – 5/6" ball end heavy-duty forged steel zinc plated.
    a. Adjustable hook bracket with (2) wall hooks
    b. (4) wall hooks with full width clothes rod
12. (2) barrel gun rack with rubber lining to protect gun barrels
13. Storage bin with storage bin rail
    a. 4" x 7" x 3"
    b. 5.5" x 10.5" x 5

D. Electrical system, Two-circuit plug-n-play with interconnecting cables to connect lockers together that are side by side.
1. Starter cables are required for each non-continuous locker run to customer provided electrical interface.
2. Electrical system to have two USB plugs and two standard plugs.

E. Integrated Fan System
1. Each unit to be supplied with fan system which moves air through the locker at a rate not less than 150cfm to dry wet gear and remove odor.

2.04 BENCHES

A. Product: TuffTec Benches by Scranton Products or approved equal.
1. Bench Tops: 1-1/4 inches (32 mm) thick with all edges rounded to 1/4 inch (6 mm) radius. Standard bench top size is 9-1/2 inches (241 mm) wide by length not to exceed 96 inches (2438 mm) for one single piece.
2. Aluminum Pedestals: 16 inches (406 mm) high and secured to bench tops with stainless steel tamper resistant Torx head screws and secured to floor using lead expansion shields with 2 inch (51 mm) stainless steel Phillips head machine bolts.

B. Bench Top Color: As selected by Owner from manufacturer's standard colors.

PART 3 EXECUTION

3.01 INSTALLATION

A. Wall Installation
1. Securely anchor every locker to wall and/or floor before use.
2. Anchoring to be determined by conditions at time of installation.

3. Securely anchor to adjacent locker units by bolting at four points, two at top and two at bottom, using ¼ inch plated bolts.
4. Optional: Attach sloped tops with field-installed chimney system venting from locker sloped tops into HVAC system. HVAC system should be able to achieve a minimum of 100 CFM through the interior of upper locker unit with door completely closed.

3.02 ADJUSTING

A. General Requirements: Upon completion of installation, inspect lockers and adjust for proper door and locking mechanism operation.

3.03 CLEANING

A. General Requirements
1. Clean interior and exposed exterior surfaces, removing debris, dust, dirt, and foreign substances on exposed surfaces.
2. Touch up scratches and abrasions to match original finish.
3. Polish stainless steel and non-ferrous metal surfaces.
4. Replace locker units that cannot be restored to factory-finished appearance.
5. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION

SECTION 12 48 13

ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Floor Grids and Frame Assemblies.

B. Related Sections
   1. 03 30 00 – Cast-In-Place Concrete.
   2. 09 31 13 – Ceramic Tile.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

B. The Aluminum Association.

C. The Carpet and Rug Institute (CRI).

D. The National Floor Safety Institute (NFSI).

E. International Organization for Standardization (ISO).

1.03 SUBMITTALS

A. General: Submit the following:
   1. Product data for each type of floor grid and frame specified including manufacturer's specifications and installation instructions.
   2. Shop drawings in sufficient detail showing layout of mat and frame specified including details indicating construction relative to materials, direction of traffic, spline locations, profiles, anchors, and accessories.
   3. Samples for verification purposes: Submit an assembled section of floor grid and frame members with selected tread insert showing each type of color for exposed floor grid, frame and accessories required.
   4. Maintenance data in the form of manufacturer's printed instructions for cleaning and maintaining floor grids.

1.04 QUALITY ASSURANCE

A. Flammability in accordance with ASTM E648, Class 1, Critical Radiant Flux, minimum 0.45 watts/m2.

B. Slip resistance in accordance with ASTM D-2047-96, Coefficient of Friction, minimum 0.60 for accessible routes.

C. Standard rolling load performance is 400 lb./wheel with larger loading requirements as specified (load applied to a solid 5” x 2” wide polyurethane wheel, 1000 passes without damage).

D. Single Source Responsibility: Obtain floor grids and frames from one source of a single manufacturer.

E. Utilize superior structural aluminum alloy 6063-T6 for rail connectors.

F. Utilize a manufacturer that is ISO 9001 & 14001 certified.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site ready for use and fabricated in as large sections and assemblies as practical, in unopened original factory packaging clearly labeled to identify manufacturer.

1.06 PROJECT CONDITIONS

A. Field measurements: Check actual openings for mats by accurate field measurements before fabrication. Record actual measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

B. Recessed Conditions: **IMPORTANT**: Coordination with Division 03 Concrete specifications is required. For proper installation, the concrete recess must be flat and smooth throughout. If the recess is formed by a concrete contractor, the pour dimensions may require leveling grout to achieve the proper depth and a smooth finish. The final recess depth will match the specified product and must be field verified. For proper frame installation, the side walls of the concrete recess must also be straight and smooth. Inconsistencies with the recess and side walls must be remediated prior to product installation.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Drawings and specifications are based on manufacturer's literature from Construction Specialties, Inc. unless otherwise indicated. Other manufacturers must comply with the minimum levels of material and detailing indicated on the drawings and specified herein.

2.02 MATERIALS

A. Aluminum - ASTM B 221, alloys 6063-T5, 6063-T6 for extrusions.

B. Tread insert options - refer to section 2.05.

2.03 FLOOR GRIDS

A. Model and Description - G1 Pedigrid- Cradle 2 Cradle Silver certified (carpet insert only). Shall be extruded 6105-T5 aluminum alloy tread rails joined mechanically by extruded 6106-T6 aluminum alloy key lock bars. (welding or bolting shall not be permitted.) Rail finish to be mill.
   1. Color: As selected by Owner from manufacturers standard or optional anodized colors.

2.04 GRID FRAMES

A. LB – Level Base Frame shall be 6063-T5 aluminum alloy with 1/2 inch (12.7mm) exposed surface and a depth of 1-13/16 inch (46.0mm). These assemblies receive 1/4 inch (6.4mm) thick heavy gauge TPE support cushions 1 inch (25.4mm) long mounted to each continuous foot at 20 inches (0.51m) on center. Frame color shall be supplied in mill finish. Note: Mill finish frames in contact with wet concrete to be primer coated.

2.05 TREAD INSERT OPTIONS

A. HD – MonoTuft HD™ Carpet shall meet CRI standard for good indoor air quality. Fibers shall include a minimum of 100, 12 mil monofilament fibers per square inch. Available in one of 21 standard colors as offered by manufacturer. Each carpet fiber and monofilament shall be fusion-bonded to a rigid two-ply backing to prevent fraying and supplied in continuous splice-free lengths. Anti-static carpet fibers shall contain antimicrobial additive and be treated with Scotchgard® to reduce soiling. Carpet weight shall be 33-oz./yd².
   1. Color: As selected by Owner from manufacturers standard colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
   1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Manufacturer shall offer assistance and guidance to provide a template of irregular shaped mat assemblies to ensure a proper installation.

3.03 INSTALLATION

A. Install the work of this section in strict accordance with the manufacturer's recommendations.

B. Set grid at height recommended by manufacturer for most effective cleaning action.

C. Coordinate top of grid surfaces with bottom of doors that swing across to provide ample clearance between door and grid.

3.04 CLEANING

A. It is important to the life cycle of the entrance mat that a maintenance schedule be developed which includes regular vacuuming and extraction that correctly matches the amount of traffic the mat incurs.

3.05 PROTECTION

A. After completing required frame installation and concrete work, provide temporary filler of plywood or fiberboard in recess, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of substantial completion.

B. Defer installation of floor grids until time of substantial completion of project.

END OF SECTION

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Administrative requirements:
      a. Submittals.
      b. Quality Assurance.
      c. Delivery, storage and handling.
   2. Hydraulic design of fire suppression piping for sprinkler system.
   3. Pipe and pipe fittings.
   4. Valves.
   5. Pipe hangers and supports.
   6. Sleeves and sleeve seals.
   7. Firestopping for fire suppression work.
   8. Fire suppression piping installation.
   9. Pipe and equipment identification.
   10. Piping tests.

B. Related Sections:
   1. Division 00 and 01 Sections:
      a. Administrative procedures and requirements.
      b. Environmental conditions affecting products.
   2. Section 09 91 00 - Painting: Execution requirements for piping painting specified by this Section.
   3. Section 21 13 13 - Wet-Pipe Sprinkler Systems: sprinklers to be used for various spaces and additional installation requirements.
   4. Section 28 31 00 - Alarm and Detection Systems: Connections to fire alarm system.

1.02 REFERENCES

A. American Society of Mechanical Engineers:
   1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
   2. ASME B16.3 - Malleable Iron Threaded Fittings.
   3. ASME B16.4 - Gray Iron Threaded Fittings.
   4. ASME B16.5 - Pipe Flanges and Flanged Fittings.
   5. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.

B. ASTM International:
   1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   2. ASTM A135 - Standard Specification for Electric-Resistance-Welded Steel Pipe.
   3. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
   4. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.

C. American Welding Society:
   1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
   2. AWS D1.1 - Structural Welding Code - Steel.

D. American Water Works Association:
   1. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
   2. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   3. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
   4. AWWA C600 - AWWA Standard for Installation of Ductile-Iron Mains and Their Appurtenances.

E. National Fire Protection Association:
   1. NFPA 13 - Installation of Sprinkler Systems.
   2. NFPA 14 - Standard for the Installation of Standpipe, Private Hydrants and Hose Systems.
   3. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances.

F. Underwriter Laboratories, Inc.:
   1. UL 1887 - Fire Tests of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics.

1.03 SUBMITTALS

A. Refer to Section 01 33 00 - Submittal Procedures.

B. Design Calculations:
   1. Flow test data.
   2. Hydraulic calculations.
      a. Signed by Professional Engineer with fire suppression system design expertise.

C. Shop Drawings; indicate the following:
   1. Dimensioned piping layout with sprinkler types located and designated.
   2. Remote areas for hydraulic calculations.
   3. Sprinkler riser detail including controls.
   4. Pipe support details.
   5. Floor and wall penetration seals.

D. Approved Sprinkler Piping Drawings:
   1. Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction.

E. Product Data; Submit manufacturer's catalog information:
   1. Pipe materials.
   2. Valve data and ratings, pressure gages.
   3. Sprinklers.
   4. Fire Department Connection.
   5. Backflow prevention devices.

F. Closeout Submittals:
   1. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

2. Project Record Drawings:
    a. Indicate actual locations of components and tag numbering.
    b. Indicate drain and test locations.
3. Operation and Maintenance Data:
    a. Submit one copy of the latest edition of NFPA 25 - Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.
    b. Provide maintenance instructions for components with moving parts.
    c. Submit spare parts lists and indicate local source for replacement components.

1.04 SYSTEM DESIGN

A. Provide fire sprinkler coverage for entire building [including exterior eaves and soffits].

B. Provide hydraulically designed system to NFPA 13 requirements.
1. Determine volume and pressure of incoming water supply from water flow test data.
2. Lay out piping based on review of the Contract Documents, including civil, architectural, structural, fire sprinkler, plumbing, HVAC and electrical drawings.
3. Locate piping to maintain clearances and not interfere with indicated ceiling heights and other systems.

C. Refer to Section 21 13 13 for criteria to locate sprinklers in lay-in ceiling tiles.

D. Interface fire sprinkler system with building fire alarm system.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 13 and requirements specified herein.

B. Pressure rating for materials: 175 PSIG minimum.

C. Comply with local fire marshal requirements.

D. Verify local requirements prior to bidding and include work associated with incorporating the local requirements into the design.

E. Designer requirement: Licensed Professional Engineer with fire sprinkler design expertise.

F. Certification: Shop drawings and hydraulic calculation report signed by Licensed Professional Engineer.

1.06 QUALIFICATIONS

A. Manufacturer: Companies specializing in manufacturing products specified in this section with minimum 3 year experience.

B. Products: UL listed for fire suppression service.

C. Installer: Company specializing in performing Work of this Section with minimum 3 year experience.

D. Designer qualifications: NICET Level 2 designer working under the direct supervision of a Licensed Professional Engineer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Deliver to jobsite and store products in original packaging until installation.

C. Furnish cast iron and steel valves with temporary protective coating.

D. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.08 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

1.09 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish extra sprinklers and metal storage cabinet under provisions of NFPA 13.

C. Furnish suitable wrenches for each sprinkler type.

PART 2 PRODUCTS

2.01 VALVES

A. Manufacturers:
1. Crane.
2. Grinnell.
3. Jenkins.
4. Kitz.
5. Stockham.
6. Watts.

B. Gate Valves:
1. Up to and including 2 inches: Bronze body and trim, rising stem, hand wheel, solid wedge or disc, threaded ends.
2. Over 2 inches: Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, hand wheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends.
3. Over 4 inches: Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

C. Globe and Angle Valves:
1. Up to and including 2 inches: Bronze body, bronze trim, rising stem and hand wheel, inside screw, renewable rubber disc, threaded ends, with back seating capacity packable under pressure.
2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

D. Ball Valves:
   1. Up to and including 2 inches: Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle, threaded ends.
   2. Over 2 inches: Manufacturers: Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive hand wheel for sizes 10 inches and over, flanged.

E. Butterfly Valves:
   1. Bronze Body: Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, hand wheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.
   2. Cast or Ductile Iron Body: Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or grooved ends. With extended neck, hand wheel and gear drive and integral indicating device, and external tamper switch rated 10 amp at 115 volt AC.

F. Check Valves:
   1. Up to and including 2 inches: Bronze body and swing disc, rubber seat, threaded ends.
   2. Over 2 inches: Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends.
   3. 4 inches and over: Iron body, bronze disc with stainless steel spring, resilient seal, flanged ends.

G. Drain Valves:
   1. Compression Stop: Bronze with hose thread nipple and cap.
   2. Ball Valve: Brass with cap and chain, 3/4 inch hose thread.

2.02 BURIED PIPING

A. Ductile Iron Pipe: AWWA C151.
   1. Fittings: AWWA C110, standard thickness.
   2. Joints: AWWA C111, rubber gasket.
   3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

2.03 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A53/A53M UL listed, threadable, Schedule 40 black.
   1. Steel Fittings: ASTM A234/A234M, wrought carbon steel and alloy steel.
   2. Malleable Iron Fittings: ASME B16.3, threaded fittings.
   3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

B. Steel Pipe: ASTM A135/135M UL listed, threadable, light wall; Schedule 10 black or galvanized.
   1. Steel Fittings: ASTM A234/A234M, wrought carbon steel and alloy steel.
   2. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.04 FIRE DEPARTMENT CONNECTION

A. Flush mounted, brass, two-way connection with 4" outlet and two 2-1/2" spring check inlet butts, complete with caps and chains.

B. Escutcheon Plate: Round, brass, wall type.
   1. Escutcheon Plate Marking: Similar to "AUTO SPKR."
   2. Finish: Rough brass or bronze.

2.05 BACKFLOW

A. Double check
   1. Standard: ASSE 1015 or AWWA C510.
   2. Operation: Continuous-pressure applications unless otherwise indicated.
   3. Pressure Loss: 5 psig maximum, at design flow rate.
   4. Body Material: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
   5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
   6. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

2.06 PRESSURE GAUGES

A. Underwriters Laboratories Listed, 4-1/2" dial type 200 to 300 psi range.

2.07 WATER FLOW SWITCH

A. Wet Systems:
   1. Paddle type with two (2) single pole double throw switches and adjustable retard.

2.08 ELECTRICALLY OPERATED ALARM BELL:

A. Standard: UL 464.

B. Type: Vibrating, metal alarm bell.

C. Size: 8-inch diameter.

D. Finish: Red-enamel factory finish, suitable for outdoor use.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.09 ZONE CONTROL MODULE

A. Integrated test and drain valve, test orifice, flow switch, and pressure gauge.

2.10 MECHANICAL SLEEVE SEALS

A. Manufacturers:
   1. Advance Products & Systems, Inc.
   2. Calpico, Inc.

3. Link-Seal, Inc.
4. Metraflex Co.

B. Description:
1. Modular sealing system designed for field assembly, to fill annular space between pipe and sleeve.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Provide quantity required to seal opening based on pipe and sleeve sizing.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.11 PIPE HANGERS AND SUPPORTS

A. Conform to NFPA 13.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

G. Vertical Support: Steel riser clamp or angle ring.

H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

I. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.12 IDENTIFICATION

A. Provide a list of spare sprinklers, including Sprinkler Identification (SIN), General Description, Temperature Rating and Quantity to be maintained within the spare sprinkler cabinet(s).

B. Provide Hydraulic Design Information Sign and locate on beaded chain at fire sprinkler riser.

PART 3 EXECUTION

3.01 DESIGN

A. Design the entire fire protection system and coordinate work with other trades using the most stringent design criteria: indicated on the drawings, fire marshal's requirements and NFPA 13.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare pipe for grooving including cleaning, in accordance with coupling manufacturer's pipe preparation standards.
   1. Pipe:
      a. Verify pipe is sufficiently free of indentations, projections, weld seams and roll marks on the exterior of the pipe over the entire gasket seating area.
      b. Verify that pipe ends are square cut.
   2. Gaskets:
      a. Check gasket to verify it is suited for the intended service.
      b. Lubricate the gasket exterior including the lips and/or pipe ends and housing interiors.
      c. Brush lubricant around the entire pipe and coupling circumference.

3.03 INSTALLATION - BURIED PIPING SYSTEMS

A. Layout:
   1. Coordinate underground piping locations with structural footings.
   2. Establish elevations of buried water piping with not less than 7 ft of cover outside of building.
   3. Establish minimum separation of 10 feet from water piping or sanitary sewer piping in accordance with Minnesota Plumbing Code.

B. Excavate pipe trench in accordance with Division 31.

C. Install ductile iron piping in accordance with AWWA C600.

D. Install PVC piping on a continuous granular bed in accordance with ASTM D2321.
   1. Place bedding material at trench bottom to provide uniform bedding for piping.
   2. Level bedding materials in one continuous layer not exceeding 4 inches compacted loose depth.
   3. Compact to 95 percent maximum density.

E. Install pipe on prepared bedding.

F. Pipe Cover and Backfilling:
   1. Backfill trench in accordance with Division 31.
   2. Maintain optimum moisture content of fill material to attain required compaction density.
   3. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 6 inches compacted layers to 6 inches minimum cover over top of jacket. Compact to 95 percent maximum density.
   4. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
   5. Do not use wheeled or tracked vehicles for tamping.

G. Install plastic ribbon tape continuous over top of pipe. Buried 6 inches below finish grade, above pipeline.

3.04 INSTALLATION - ABOVE GROUND PIPING

A. Install piping in accordance with NFPA 13 for sprinkler systems, and NFPA 24 for service mains.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Install pipe sleeve at piping penetrations through footings, walls, and floors.
   1. Seal footing penetrations with mechanical sleeve seals.
   2. Seal pipe and sleeve penetrations to maintain fire resistance equivalent to fire separation.

E. Install control valves to isolate each riser and each floor including drains, water flow devices, test connections and tamper switches.

F. Grooved Pipe Assembly:
   1. Assemble couplings, fittings, valves and pipe in accordance with the latest published instructions from the manufacturer.

G. Install fire department connection where indicated on the Drawings subject to approval by authority having jurisdiction.
   1. Provide a ball drip at bottom of pipe at the fire department connection.

H. Mount the detector check meter on 24" high pipe supports.

I. Install a tamper switch on each manual shut-off valve to alarm when the valve is two (2) turns from fully open.

J. Install a tamper switch on the post or wall indicator valve (WIV) to alarm when the valve is two (2) turns from fully open.

K. Pitch branch piping, cross mains and mains to drainage points.

L. Provide alarm test modules and/ or inspector's test connections and gauges in accordance with NFPA 13.
   1. Extend inspector's test pipe down to within 6'-0" of floor with globe valve and with discharge piped as approved.

M. Provide drain connection for each sprinkler riser, including an angle valve, pressure gauge and inspector's test plug.

N. Provide chrome plated escutcheons on exposed pipes passing through walls and ceilings in finished areas.

O. Provide pipe sleeve at cast-in-place concrete floor penetrations.

P. Pipe Hangers and Supports:
   1. Install in accordance with NFPA 13 [and] [NFPA 14].
   2. Install hangers with minimum 1/2 inch space to adjacent work.
   3. Use hangers with 1-1/2 inch minimum vertical adjustment.

4. Support vertical piping at every floor.
5. Support riser piping independently of connected horizontal piping.

Q. Prepare pipe, fittings, supports, and accessories for finish painting.
1. Refer to Section 09 90 00.
2. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
3. Prime coat exposed steel hangers and supports.
a. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

R. Do not penetrate building structural members unless indicated.

S. Where more than one piping system material is specified, install compatible system components and joints.

T. Install valves with stems upright or horizontal, not inverted.

U. Install gate, ball, or butterfly valves for shut-off or isolating service.

V. Install drain valves at main shut-off valves, low points of piping and apparatus.

W. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

3.05 COORDINATION

A. Install the work to avoid conflicts with other trades.

B. Notify the Architect/ Engineer of conflicts between fire suppression work and that of other trades that cannot be resolved through adjustments to fire suppression pipe locations.

C. Remove Work installed by this Contractor which interferes with the work of other trades.

3.06 PRESSURE TESTS

A. Test fire suppression piping systems under a 200 PSIG hydrostatic pressure for two (2) hours.

B. Air test the dry piping system at 40 PSIG for 24 hours with no greater than 1-1/2 PSIG pressure loss.

3.07 FIRE STOPPING

A. Firestop pipe penetrations of masonry walls, rated walls and partitions and above grade floors.

B. Refer to Section 07 84 00 - Firestopping for acceptable products and procedures.

3.08 WELDING

A. Perform welding using certified welders.
   1. ASME "Qualification Standard for Welding Procedures, Welders and Welding Operations."
      a. Certification: For the type of work being performed.
   2. Submit copies of the welder's certification to the superintendent prior to welding.

3.09 CUTTING AND PATCHING

A. Perform cutting and patching necessary for the installation of the fire suppression system.
   1. Review complete drawing set to determine if cutting and patching is covered by other trades.
   2. Do not cut structural members.
   3. Core drill concrete openings up to 10 inches in diameter.

B. Perform cutting in a manner directed by the cut materials trade or the General Contractor.

C. Patching: Match adjacent surfaces to the satisfaction of the Architect.

3.10 INTERFACE WITH OTHER PRODUCTS

A. Inserts:
   1. Attach inserts to concrete forms, flush with slab surface.
   2. Install hooked rod extended to concrete reinforcement for inserts carrying pipe over 4 inches.

3.11 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Remove protective coatings from valves and accessories.

C. Clean entire system after other construction is complete.

D. Notify painter of masking materials not removed after painting is complete.

END OF SECTION

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SECTION 21 13 13

WET-PIPE SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes wet-pipe sprinklers and dry sprinklers for fire suppression.

B. Related Sections:
   1. Section 21 05 00 – Common Work Results for Fire Suppression:
      a. Design and submittal requirements.
      b. Requirements for piping, valves, hangers and specialties.
   2. Section 21 13 16 - Dry-Pipe Sprinkler Systems.

1.02 REFERENCES

A. National Fire Protection Association:
   1. NFPA 13 - Standard for the Installation of Sprinkler Systems.

PART 2 PRODUCTS

2.01 SPRINKLERS

A. Manufacturers:
   1. Automatic Sprinkler Corp.
   2. Grinnell Corp.
   3. Reliable Sprinkler Corp.
   4. Viking.

B. Suspended Ceiling Type:
   1. Type: Quick response, concealed.
   2. Finish: Rough brass with factory painted white cover plate.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Exposed Area Type:
   1. Type: Quick response, Standard upright type.
   2. Finish: Brass.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Side wall Type:
   1. Type: quick response, semi recessed horizontal side wall type with matching escutcheon.
   2. Finish: Chrome plated.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

E. Guards: Finish to match sprinkler finish.

PART 3 EXECUTION

3.01 INSTALLATION

A. Refer to Section 21 05 00 Common Work Results for Fire Suppression; installation of piping and special ties.

B. Install in accordance with NFPA 13.

A. Sprinkler Location Criteria:
   1. Locate sprinklers in the center of ceiling tile when this will not require additional sprinklers.
   2. Locate sprinklers not less than 9 inches from edge of ceiling tile, including escutcheon.
   3. Locate sprinklers in lines parallel to the ceiling grid for entire length of each room.
   4. Mark shop drawings where this criteria is not adhered to for review by the Architect.

B. Install guards on sprinklers located in storage and data room areas.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Verify signal devices are installed and connected to fire alarm system.

3.03 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Notify superintendent of any remaining tape or covering on sprinklers protected from painting.

3.04 SCHEDULES

A. System Hazard Areas:

Location	System Type	Hazard
Offices	Wet-Pipe	Light Hazard
Mechanical and Electrical Rooms, Warehouse, Storage Rooms.	Wet-Pipe	Ordinary Hazard, Group 2
Office	Wet Pipe	Light Hazard
Vestibules, exterior soffits, and similar areas subject to freezing	Wet-Pipe, use dry sprinkler	Light Hazard

END OF SECTION

SECTION 21 13 16

DRY-PIPE SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes dry-pipe sprinklers and piping for fire suppression.

B. Related Sections:
   1. Section 21 05 00 – Common Work Results for Fire Suppression:
      a. Design and submittal requirements.
      b. Requirements for piping, valves, hangers and specialties.

C. Select sprinkler orifice and temperature rating to match application.

1.02 REFERENCES

A. National Fire Protection Association:
   1. NFPA 13 - Standard for the Installation of Sprinkler Systems.

1.03 EXTRA MATERIALS

A. Furnish extra sprinklers in accordance with the requirements of NFPA 13.

B. Furnish suitable wrenches for each sprinkler type.

C. Furnish metal storage cabinet adjacent to alarm valve.

PART 2 PRODUCTS

2.01 SPRINKLERS

A. Manufacturers:
   1. Automatic.
   2. Central.
   3. Gem.
   4. Grinnell.
   5. Reliable.
   6. Star.
   7. Viking.

B. Exposed Area Type:
   1. Type: Quick response, Standard upright type.
   2. Finish: Brass.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Side wall Type:
   1. Type: Quick response, semi recessed horizontal side wall type with matching escutcheon.
   2. Finish: Chrome plated.

3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Guards: Metallic; match sprinkler finish.

2.02 PIPING AND SPECIALTIES

A. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate electric alarm, with accelerator; with test and drain.

B. Electric Alarm: Electrically operated aural and visual alarm with pressure alarm switch.

C. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125-volt AC and 2.5 amp at 24 volt DC.

D. Fire Department Connection:
1. Y Pattern Siamese valve with wall flange.
2. Flush mounted wall type with brass finish.
3. Flush mounted wall type with chrome plated finish.
4. Free standing type with ductile iron pedestal; [brass] [chrome plated] [red enamel] finish.
5. Connections: Two way with caps and chains; threads to match local requirements.
6. Drain: 3/4 inch ball drip outlet, match finish of hose connections.
7. Placard: “Sprinkler – Fire Department Connection”.

2.03 AIR COMPRESSOR

A. Compressor: Single unit, electric motor driven, motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloading valve.

B. Electrical Characteristics: Not to exceed 10 amps, 120 V, single phase, 60 Hz.

PART 3 EXECUTION

3.01 INSTALLATION

A. Refer to Section 21 05 00 Common Work Results for Fire Suppression; installation of piping and specialties.

B. Install in accordance with NFPA 13.

C. Install guards on sprinklers located in storage rooms.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Verify signal devices are installed and connected to fire alarm system.

3.03 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Notify superintendent of any remaining tape or covering on sprinklers protected from painting.

3.04 SCHEDULES

A. System Hazard Areas:

Location	System Type	Hazard
Unheated areas	Dry-Pipe	Ordinary Hazard, Group 2
Tipping floor	Dry-Pipe	Ordinary Hazard, Group 2

END OF SECTION

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SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Administrative and procedural requirements for plumbing systems and Division 22 Sections:
      a. References to standards.
      b. Submittals.
      c. Quality Assurance.
      d. Delivery, storage and handling.
   2. Pipe, pipe fittings and installation requirements common to multiple Sections:
      a. Facility water distribution.
      b. Facility sanitary sewerage.
      c. Facility storm drainage.
   3. General duty valves common to multiple Sections.
   4. Pipe hangers and supports common to multiple Sections.
   5. Firestopping relating to plumbing work.
   6. Pipe and equipment identification.
   7. Cleaning.
   8. Selective demolition.

B. Related Sections:
   1. Division 00 and 01 Sections:
      a. Administrative procedures and requirements.
      b. Environmental conditions affecting products.
   2. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this Section.
   3. Section 07 84 00 - Firestopping: Product and execution requirements for firestopping for placement by this Division.
   4. Section 09 91 00 - Painting and Coating: Product and execution requirements for painting specified by this Section.
   5. Section 21 05 00 Common Work Results for Fire Suppression: Administrative and procedural requirements for HVAC ductwork, piping and equipment.
   6. Section 22 07 00 - Plumbing Insulation: Insulation requirements related to sizing pipe hangers to encompass insulation.
   7. Section 22 11 00 Facility Water Distribution: Specialty valves and plumbing specialties.
   8. Section 22 13 00 Facility Sanitary Sewerage: Floor drains and cleanouts.
   9. Section 22 14 00 Facility Storm Drainage: Area drains, roof drains, downspout nozzles.
   10. Section 23 05 00 Common Work results for HVAC: Administrative and procedural requirements for HVAC ductwork, piping and equipment.

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):

1. A13.1 - Scheme for the Identification of Piping Systems.
2. B16.3 - Malleable Iron Threaded Fittings.
3. B16.4 - Gray Iron Threaded Fittings.
4. B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
5. B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
6. B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes
7. B31.9 - Building Services Piping.

B. ASTM International (ASTM):
1. A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
3. A536 - Standard Specification for Ductile Iron Castings.
4. A674 - Standard practice for polyethylene encasement for ductile iron pipe for water or other liquids.
5. A 888 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, And Vent Piping Applications.
6. B88 - Standard Specification for Seamless Copper Water Tube.
7. C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
8. C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.
9. C1540 - Standard Specification for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.
10. C 1563 - Standard Test Method for Gaskets for Use in Conjunction With Hub and Spigot Cast Iron Soil Pipe and Fittings for Sanitary Drain, Waste, Vent, and Storm Piping Applications.
11. D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
12. D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series).
13. D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
14. D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
15. D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
16. D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
17. D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
18. D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
19. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
20. E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
21. E814 - Standard Test Method for Fire Tests of Through Penetration Fire Stops.
22. E1966 - Standard Test Method for Fire-Resistive Joint Systems.
23. F492 - Standard Specification for Propylene and Polypropylene (PP) Plastic-Lined Ferrous Metal Pipe and Fittings
24. F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
25. F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
26. F1866 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings.

C. American Welding Society (AWS):
   1. A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
   2. D1.1 - Structural Welding Code - Steel.

D. American Water Works Association (AWWA):
   1. C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
   2. C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   3. C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
   4. C600 - Standard for Installation of Ductile-Iron Water Mains and their Appurtenances.
   5. M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

E. Cast Iron Soil Pipe Institute (CISPI):
   1. 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
   2. 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

F. International Association of Plumbing and Mechanical Officials (IAPMO):
   1. PS 117 – Copper and Copper Alloy Tubing System Incorporating Press-Type or Nail-Type Connections.

G. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:
   1. SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
   2. SP 69 - Pipe Hangers and Supports - Selection and Application.
   3. SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
   4. SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
   5. SP 80 - Bronze Gate, Globe, Angle and Check Valves.
   6. SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
   7. SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

H. National Sanitation Foundation International (NSF):
   1. 61 - Drinking Water System Components - Health Effects.

I. Underwriters Laboratories Inc. (UL):
   1. 263 - Fire Tests of Building Construction and Materials.
   2. 723 - Tests for Surface Burning Characteristics of Building Materials.
   3. 1479 - Fire Tests of Through-Penetration Firestops.
   4. 2079 - Tests for Fire Resistance of Building Joint Systems.
   5. Fire Resistance Directory.

1.03 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to applicable code for fire resistance ratings and surface burning characteristics.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 for:
   1. Electronic Submittal requirements.
   2. Transmittal requirements.

3. Submittals regarding color selections.
4. Substitutions.
5. Coordination with other trades.
6. Coordination and approval from public agencies.
7. Deviations from Contract Documents.

B. Product Data:
1. Submit data on pipe materials and fittings.
2. Submit manufacturers catalog information:
a. Valves.
b. Pipe identification.
c. Equipment Identification.

C. Closeout Submittals:
1. Submit certification of water disinfection and chlorination.
2. Submit copies of plumbing inspector acceptance of air and water column tests.
3. Submit Operation and Maintenance manuals in accordance with closeout procedures.

D. Project Record Documents:
1. Provide dimensioned drawings indicating installed location of underground piping.
2. Record actual locations of tagged valves; include valve tag numbers.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.9 code for installation of piping systems.

B. Use joint grooving tools and materials provided from a single manufacturer.

C. For domestic water piping and valves, use products certified to meet NSF 61.

D. Dezincification resistant: Bronze valve chemical make-up for components in the waterway to not exceed 15 percent zinc.
1. Certify valves to be dezincification resistant to the criteria listed above.

E. Perform Work to comply with the latest edition of the Minnesota State Building Code including Chapter 4714, the Minnesota Plumbing Code.

F. Perform Work to comply with the latest edition of The Wisconsin Administrative Code.

G. Perform Work to comply with the latest edition of Iowa State Building Code.

H. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

1.06 QUALIFICATIONS

A. Explanation of manufacturer listings for Part 2 - Products of Division 22 Sections:
1. Select equipment from the listed manufacturers where a list of manufacturers is under the heading "Manufacturers":
a. Manufacturers not listed must submit for and be granted approval prior to the end of the bidding period for use on this Project.

b. The list of manufacturers is provided as a convenience to the Contractor, indicating manufacturers that may be able to meet the indicated requirements.
c. Being listed does not indicate the availability of any product or approval of a product not containing the indicated features.

2. Use products meeting the indicated requirements where a list of manufacturers is under the heading "Acceptable Manufacturers":
   a. Approval to use products from manufacturers not listed is not a bid requirement.
   b. The list of manufacturers is provided as a convenience to the Contractor, indicating manufacturers that may be able to meet the indicated requirements.
   c. Being listed does not indicate the availability of any product or approval of a product not containing the indicated features.
3. Use products meeting the indicated requirements where manufacturers are not listed for products:
   a. Approval to use products from manufacturers not listed is not a pre-bid requirement.

B. Manufacturers: Company specializing in manufacturing products specified in this Division with minimum 3 years experience.

C. Installer: Company specializing in performing work of this Division with minimum 3 years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 01 60 00: Requirements for transporting, handling, storing, and protecting products.

B. Provide temporary caps on fittings and valves removed from shipping containers and not immediately installed.

C. Provide temporary end caps and closures on pipes stored on site, but not installed.

D. Protect installed piping from entry of foreign materials using temporary covers for idle sections of the Work.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Refer to Section 01 60 00: Environmental conditions affecting products on site.

B. Do not install underground piping when bedding is wet or frozen.

1.09 COORDINATION

A. Refer to Section 01 31 00: Requirements for Coordination.

B. Coordinate installation of buried piping with trenching and footing installation.

1.10 WARRANTY

A. Refer to Section 01 07 00: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING.

A. Match material specified by Civil for water service entrance.

B. Ductile iron pipe conforming to AWWA C151/ANSI 21.51.
   1. Joints conforming to AWWA C111.
   2. Provide anchor rods for bends, tees and plugs.
   3. Use thrust blocks for 45 degree or greater elbows.
   4. Cast iron mechanical joint fittings: AWWA C110
   5. Joint restraints: MJ FIELD-LOK as manufactured by U.S. Pipe or equivalent.

C. Copper Tubing conforming to ASTM B88:
   1. 2-1/2 inches and smaller, Type K, soft copper, seamless.
   2. No underground fittings except at connection to site utility.

D. Match Civil for water service entrance.

2.02 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L seamless, hard temper:
   1. Fittings: ASME B16.18, wrought copper.
   2. Joints: 95/5 solder or brazing.

B. Copper Tubing: ASTM B88, Type L, seamless, hard temper:
   1. Press Fitting Systems:
      a. ASTM F3226/F3226M copper alloy
      b. IAPMO PS 117 performance criteria.
      c. EPDM sealing elements.
      d. Viega – ProPress, up to 4 inch.
      e. Victaulic – Permalynx up to 1-1/2 inch.
      f. Nibco – Nibco Press System up to 4 inch.

2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Refer to Section 22 13 00.

B. Cast Iron Soil Pipe: ASTM A74, service weight, bell and spigot ends:
   1. Fittings: Cast iron, ASTM A74.
   2. Joints: Hub-and-spigot, compression type with ASTM C564 neoprene gaskets.

C. Hubless Cast Iron Pipe: CISPI 301 and ASTM A888.
   1. Fittings: Cast iron, CISPI 301.
   2. Couplings: ASTM C1540 heavy duty, shielded.

D. PVC Pipe: Schedule 40, ASTM D1785/D2466, with mechanical ring, or fusion or solvent cement.
   1. Fittings: PVC, ASTM F1866, ASTM D2665
   2. Joints: Solvent weld with ASTM D2564 solvent cement.
   3. Provide contrasting color primer for solvent weld joints.

4. Do not use plastic piping in the following locations:
    a. Commercial kitchen drains, boiler room drains.

2.04 SANITARY SEWER PIPING, ABOVE GRADE (WASTE AND VENT)

A. Hubless Cast Iron Pipe: CISPI 301 and ASTM A888.
    1. Fittings: Cast iron, CISPI 301.
    2. Couplings: ASTM C1277 and CISPI 310, shielded.

B. PVC Pipe:
    1. Schedule 40, ASTM D1785/D2466 with solvent welded joints.
    2. Fittings: PVC, ASTM D1866, ASTM D2665.
    3. Joints: Solvent weld with ASTM D2564 solvent cement.
    4. Do not use plastic piping in the following locations:
        a. Ceiling cavities above rooms served by transfer grilles (air plenums).
        b. Commercial kitchen drains, boiler room drains.
        c. Locker rooms or shower areas where piping is exposed.
        d. Within 8 feet of the floor where piping is exposed [to public].

C. Copper Tubing
    1. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.
    2. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
    3. Copper Pressure Fittings:
        a. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
        b. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
    4. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
        a. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
        b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
    5. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

D. Pressurized waste discharge (i.e. elevator sump pumps, sewage ejectors, etc.):
    1. Pipe: Schedule 40 galvanized steel.
    2. Fittings: ASME B16.3 Malleable iron galvanized steel, threaded.
    3. Fittings: ASME B16.4 Grey iron, threaded.

2.05 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Refer to Section 22 14 00.

B. Cast Iron Soil Pipe: ASTM A74, service weight, bell and spigot ends:
    1. Fittings: Cast iron, ASTM A74.
    2. Joints: Hub-and-spigot compression type with ASTM C564 neoprene gaskets.

C. Hubless Cast Iron Pipe: CISPI 301 and ASTM A888.
    1. Fittings: Cast iron, CISPI 301.
    2. Couplings: ASTM C1540 heavy duty, shielded.

D. PVC Pipe:
   1. Schedule 40, ASTM D1785 with solvent welded joints.
   2. Fittings: PVC, ASTM D2665.
   3. Joints: Solvent weld with ASTM D2564 solvent cement. Provide contrasting color primer for solvent weld joints.

2.06 STORM WATER PIPING, ABOVE GRADE

A. Refer to Section 22 14 00.

B. Cast Iron Soil Pipe: ASTM A74, service weight, bell and spigot ends:
   1. Fittings: Cast iron, ASTM A74.
   2. Joints: Hub-and-spigot compression type with ASTM C564 neoprene gaskets.

C. Hubless Cast Iron Pipe: CISPI 301 and ASTM A888.
   1. Fittings: Cast iron, CISPI 301.
   2. Couplings: ASTM C1277 and CISPI 310, shielded.

D. Pressurized waste discharge (i.e. clear water sump pumps, etc.):
   1. Pipe: Schedule 40 galvanized steel.
   2. Fittings: ASME B16.3 Malleable iron galvanized steel, threaded.
   3. Fittings: ASME B16.4 Grey iron, threaded.

E. PVC Pipe:
   1. Schedule 40, ASTM D1785 with solvent welded joints.
   2. Fittings: PVC, ASTM D2665.
   3. Joints: Solvent weld with ASTM D2564 solvent cement. Provide contrasting color primer for solvent weld joints.
   4. Do not use plastic piping in the following locations:
      a. Ceiling cavities above rooms served by transfer grilles (air plenums).
      b. Locker rooms or shower areas where piping is exposed.
      c. Within 8 feet of the floor where piping is exposed.

2.07 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.
   1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
   2. Joints: Threaded for pipe 2 inch and smaller.

B. Copper Tubing: ASTM B88, Type M, hard temper.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder.

C. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26, polyvinyl chloride (PVC) material.
   1. Fittings: ASTM D2466, Schedule 40, PVC.
   2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.08 GATE VALVES

A. Acceptable Manufacturers:
   1. Crane.

2. Grinnell.
3. Hammond.
4. Milwaukee.
5. Nibco, Inc.
6. Stockham.

B. 2 inch and smaller:
1. MSS SP-80, 200 psi CWP, rising stem, screw-in bonnet.
2. Bronze body, bonnet, external stuffing box and wedge; ASTM B-62.
3. Stem: Silicon bronze, ASTM B-371 or low-zinc alloy B-99.
4. Non-asbestos packing and malleable or ductile iron handwheel.
5. Threaded or sweat ends.

C. 2-1/2 inch and larger:
1. MSS SP-70, 200 psi CWP, bolted bonnet, non-rising stem.
2. Cast iron body, bonnet, stuffing box, handwheel and wedge; ASTM A 126 Class B.
3. Stem: Steel, ASTM A 108.
4. Non-asbestos packing.
5. Flanged ends.

2.09 BALL VALVE

A. Acceptable Manufacturers:
1. Apollo Valve.
2. Jomar Valve.
3. Grinnell.
4. Milwaukee.
5. Nibco, Inc.
6. Watts.

B. 2 Inches and Smaller: NSF 61. MSS SP 110.
1. 600 WOG, 2-piece, full port, forged brass body.
2. Chrome plated brass or stainless steel ball.
3. Reinforced PTFE seats.
4. Extended stems for insulation.
5. Threaded or sweat ends.

2.10 HORIZONTAL SWING CHECK VALVES

A. Acceptable Manufacturers:
1. Crane
2. Grinnell.
3. Jomar Valve.
4. Hammond.
5. Milwaukee.
6. Nibco, Inc.
7. Stockham.

B. 2 inch and smaller:
1. 200 pound CWP, bronze body, bronze disc.
2. Buna-N coated bronze seat disc.
3. Threaded ends.

C. 2-1/2 inch and larger:
   1. 200 pound CWP, iron body, bolted cast iron bonnet, flanged ends.
   2. Bronze disc to 4 inch size, ductile iron disc with bronze face ring over 4 inch.

2.11 GLOBE VALVES

A. Acceptable Manufacturers:
   1. Crane
   2. Grinnell.
   3. Jomar Valve
   4. Hammond.
   5. Milwaukee.
   6. Nibco, Inc.
   7. Stockham.

B. 2 inch and smaller:
   1. MSS SP-80, 200 psi CWP, screw-in bonnet.
   2. Bronze body, bonnet, disc holder and seat disc; ASTM B-62.
   3. Stem: Silicon bronze, ASTM B-371 or low-zinc alloy B-99.
   4. Non-asbestos packing and malleable or ductile iron handwheel.
   5. Threaded or sweat ends.

C. 2-1/2 inch and larger:
   1. MSS SP-85, 200 psi WOG, solid disc, bolted bonnet, outside screw and yoke.
   2. Cast iron body, bonnet and handwheel; ASTM A 126 Class B.
   3. Stem: Brass; ASTM B 16.
   4. Non-asbestos packing, flanged ends.

2.12 BALANCING VALVES

A. Acceptable Manufacturers:
   1. Armstrong.
   2. Bell & Gossett.
   3. Taco.
   4. Tour Andersson.
   5. Victaulic.
   6. Watts.

B. Features:
   1. Multi-turn globe style or brass ball with glass and carbon filled TFE seat rings.
   2. Differential pressure readout ports with EPT insert and check valve.
   3. Multi-turn indicator or memory stop allowing closure and return to balanced position.
   4. Calibrated nameplate.

C. 1/2 inch to 2 inch size:
   1. Bronze body, threaded connections.

D. 2-1/2 inch to 4 inch size:
   1. Cast iron body, 125 psi ANSI flanged connections.
   2. Ductile iron body with cut grooved connections.

2.13 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
   1. Ferrous Piping: Class 150, malleable iron, threaded.
   2. Copper Piping: Class 150, bronze unions with soldered ends.

B. Flanges for Pipe 2-1/2 inches and larger:
   1. Ferrous piping: Class 150 forged steel slip-on flanges.
   2. Copper piping: Class 150 slip-on bronze flanges.
   3. Gaskets: 1/16 inch thick preformed neoprene gaskets.
   4. Grooved mechanical couplings for grooved piping systems.

C. Dielectric Connections: Union or waterway fitting with galvanized or plated steel or ductile iron casing, with threaded end, grooved end, copper solder end, water impervious isolation barrier. NSF 61, ASTM F-492; Victaulic Style 47 or acceptable substitute.

2.14 PIPE HANGERS AND SUPPORTS

A. Acceptable Manufacturers:
   1. Anvil (Grinnell).
   2. B-Line - Cooper.
   3. Elcen
   4. Erico - Caddy System.
   5. Fee and Mason.
   6. Michigan Hanger Co.
   7. PHD Manufacturing.

B. Plumbing Piping - DWV:
   1. Conform to ASME B31.9.
   2. Grinnell Fig. 69 Carbon steel, adjustable, clevis.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   4. Wall Support for Pipe Sizes 3 inches and Smaller: Grinnell Fig. 126 Cast iron hook.
   5. Wall Support for Pipe Sizes 4 inches and Larger: Grinnell Fig. 194 or 15 Welded steel bracket and wrought steel clamp.
   6. Vertical Support: Steel riser clamp.
   7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   8. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

C. Plumbing Piping - Water:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
   5. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger.
   6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
   8. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
   9. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
   10. Wall Support for Hot Pipe Sizes 6 inches and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Copper-plated, Carbon-steel ring.

D. ACCESSORIES
1. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.
2. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.15 FLASHING

A. Metal Flashing: 26-gauge galvanized steel.

B. Metal Counterflashing: 22-gauge galvanized steel.

C. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

D. Caps: Steel, 22-gauge minimum; 16-gauge at fire resistant elements.

2.16 SLEEVES

A. Sleeves for Pipes Through Non-Fire Rated Floors: 18-gauge thick galvanized steel.

B. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18-gauge thick galvanized steel.

2.17 MECHANICAL SLEEVE SEALS

A. Acceptable Manufacturers:
1. Thunderline Link-Seal, Inc.
2. NMP Corporation.

B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.18 ESCUTCHEONS

A. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.

2.19 FORMED STEEL CHANNEL

A. Acceptable Manufacturers:
1. Elcen.

2. B-Line Systems.
3. Hilti.
4. Powerstrut, Inc.
5. Unistrut Corp.
6. Fee and Mason.

B. Product Description: Galvanized 12-gauge thick steel. With holes 1-1/2 inches on center.

2.20 FIRESTOPPING

A. Acceptable Manufacturers:
1. Dow Corning Corp.
2. Fire Trak Corp.
3. Hilti Corp.
4. International Protective Coating Corp.
5. 3M fire Protection Products.
6. Specified Technology, Inc.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only 1 type for each similar application:
1. Silicone Firestopping Elastomeric Firestopping: Multiple component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Multiple component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device With Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

2.21 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material - Permanent:
1. Mineral fiberboard.
2. Mineral fiber matting.
3. Sheet metal.
4. Alumina silicate fire board.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

D. General:
1. Furnish UL listed products or products tested by independent testing laboratory.
2. Select products with rating not less than rating of wall or floor being penetrated.

2.22 VALVE TAGS

A. Plastic Tags:
   1. Acceptable Manufacturers:
      a. W.H. Brady.
      b. Marketing Systems, Inc.
      c. MSI.
      d. Seton Identification Products.
   2. Laminated 3-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter.

2.23 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Plastic Pipe Markers:
   1. Acceptable Manufacturers:
      a. W.H. Brady.
      b. Marketing Systems, Inc.
      c. MSI.
      d. Seton Identification Products.
   2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers:
   1. Acceptable Manufacturers:
      a. W.H. Brady.
      b. Marketing Systems, Inc.
      c. MSI.
      d. Seton Identification Products.
   2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.24 LABELS

A. Acceptable Manufacturers:
   1. W.H. Brady.
   2. Champion.
   3. MSI.
   4. Ready Made.
   5. Seton Identification Products.

B. Description: Laminated 3-layer rigid plastic with engraved black letters on light colored background. 1.9 inch by 0.75 inch minimum size, adhesive backed. Comply with ASME A13.1 standard for colors and locations.

2.25 WATER METER

A. Main service meter: Furnished by the City of Spring lake. Coordinate and pay associated fees to obtain city water meter for installation under this section.

B. Provide 1 inch meter for lawn irrigation flow measurement. Comply with City of Spring lake. water department requirements for deduct meter applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00: Verification of existing conditions before starting work.

B. Verify excavations are to required grade, dry, and not over-excavated.

C. Verify trenches are ready to receive piping.

D. The Contractor is responsible for verifying invert elevations with respect to building finished floor elevations and site provisions.

3.02 SELECTIVE DEMOLITION

A. Coordinate shut-down of services with Owner prior to performing removal work.
   1. Domestic water service and water distribution system.
   2. Domestic hot water distribution system.
   3. Toilets and associated plumbing fixtures.
   4. Water serving other systems:
      a. Lawn irrigation.
      b. Make up water for hydronic heating and/or cooling systems.
      c. Exterior wall hydrants.

B. Remove piping and equipment indicated for removal while protecting materials and equipment that is not indicated to be removed.

C. Provide temporary caps covering the ends of remaining piping to prevent entry of foreign materials and debris.

D. Materials removed are to be promptly disposed of or recycled, off-site.

E. Contact the Engineer for clarification in areas where the scope of work cannot be readily determined from the Drawings.

F. Reinstate remaining services promptly following the demolition work and notify the Owner when service has been restored.

3.03 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Make piping connections to equipment with flanges, grooved joint couplings, or unions.

D. Protect open ends of installed pipe with temporary plugs or caps.

E. Select hangers to surround insulation, shield and piping on insulated pipe.

3.04 INSTALLATION - FLASHING

A. Provide flexible flashing and metal counter-flashing where piping penetrates weather or waterproofed walls, floors, and roofs.

B. Flash vent pipes projecting above roof surface with flexible flashing and secure with stainless steel bands or other method approved by roofing contractor.

C. Flash floor drains in floors with topping over finished areas with flexible flashing, 10 inches clear on sides with minimum 36 by 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor, shower and drains watertight to adjacent materials.

E. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.05 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

E. Where piping penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing or firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install chrome plated steel escutcheons at finished surfaces.

3.06 INSTALLATION - BURIED PIPING SYSTEMS

A. Coordinate underground piping locations with structural footings.

B. Establish elevations of buried domestic water piping with not less than 7-feet of cover outside of building.

C. Install, support and restrain cast iron pipe, fittings and couplings in compliance with procedures detailed in ASTM C1540.

D. Establish minimum separation of 10 feet from water piping or sanitary sewer piping in accordance with Minnesota code.

E. Excavate pipe trench in accordance with Division 31.

F. Install ductile iron piping in accordance with AWWA C600.

G. Install pipe on prepared bedding.
   1. Install PVC piping on a continuous granular bed in accordance with ASTM D2321.
   2. Place bedding material at trench bottom to provide uniform bedding for piping.
   3. Level bedding materials in one continuous layer not exceeding 4 inches depth.

4. Compact to 95 percent modified Proctor density.

H. Pipe Cover and Backfilling:
1. Backfill trench in accordance with Division 31.
2. Maintain optimum moisture content of fill material to attain required compaction density.
3. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 6 inches compacted layers to 6 inches minimum cover over top of jacket. Compact to 95 percent maximum density.
4. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
5. Do not use wheeled or tracked vehicles for tamping.
6. Install plastic ribbon tape continuous over top of pipe.
   a. Bury ribbon tape 6 inches below finished grade, directly above pipe.

3.07 INSTALLATION - ABOVE GROUND PIPING

A. Install piping to conserve building space, to not interfere with use of space and other work.
1. Route piping in orderly manner and maintain gradient.
2. Route parallel and perpendicular to walls.
3. Group piping whenever practical at common elevations.

B. Sleeve pipe passing through partitions, walls and floors.

C. Slope piping and arrange systems to drain at low points.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

E. Provide shut-off valves:
1. Required by Code.
2. At each fixture supply.
3. At branch lines serving more than one fixture.
4. With extended valve stems for insulated piping applications.
5. With screwed connections for piping 2-1/2 inch and smaller.
6. With flanged connections for piping 3 inch and larger.
7. With hose end caps on low point drains.

F. Install unions downstream of valves and at equipment or apparatus connections.

G. Where pipe support members are welded, clean, and apply 1 coat of zinc rich primer to welding.

H. Support cast iron drainage piping at every joint.

I. Hubless fittings and couplings: Use the procedures described in ASTM C1277.

J. Cleanouts:
1. Provide cleanouts at the base of sanitary waste and storm drain risers.
2. Install floor cleanouts at elevation to be flush with finished floor.
3. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil.
4. Locate cleanouts to allow clearance for snaking drainage system.
5. Encase exterior cleanouts in concrete, flush with grade.

K. Install piping penetrating roofed areas to maintain integrity of roof assembly.
   1. Install vent piping penetrating roofed areas with frost proof jackets having air space of at least 1 inch between outside surface of pipe and inside surface of frost proof jacket.

L. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.

3.08 INSTALLATION - DOMESTIC WATER PIPING SYSTEMS

A. Install domestic water piping to allow for insulation. Refer to Section 22 07 00.

B. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

C. Provide swing joint offsets for branch piping penetrating adjacent walls and floors.

D. Install non-conducting dielectric unions for domestic water piping joining dissimilar metals.

E. Install press type and grooved joints in accordance with the manufacturer's latest published installation instructions. Select gaskets of an elastomer grade suitable for the intended service, produced by the coupling manufacturer.

3.09 INSTALLATION - SANITARY WASTE AND VENT PIPING SYSTEMS

A. Establish invert elevations, slopes for drainage to ¼ inch per foot minimum. Maintain gradients. [Slope at 1/8 inch per foot for sizes 4 inch and larger with administrative approval.]

B. Establish invert elevations, slopes for vents. Match drainage slope below grade; 1/16 inch per foot minimum above grade. Maintain gradients.

C. Cast iron pipe, fittings and standard couplings: Installed, supported and restrained using the installation procedures detailed in ASTM C1277.

D. Cast iron pipe, fittings and heavy duty couplings: Installed, supported and restrained using the installation procedures detailed in ASTM C1540.

E. Terminate vent pipes passing through roofs at least 12 inches above the roof line.
   1. Support at increments not to exceed those allowed by the Minnesota Plumbing Code.

F. Limit above grade plastic drain and vent piping to 35 feet total length.
   1. Support at increments not to exceed those allowed by the Minnesota Plumbing Code.

G. Provide contrasting color primer for solvent weld joints.

H. Water meter:
   1. Install water meter furnished by the Utility. Pay the meter charge if there is one.
   2. Provide meter support and other equipment and materials required by the Utility.
   3. Install upstream and downstream isolation valves. Provide union fitting or flange fitting between the isolation valves.
   4. Install remote reader in accordance with City requirements.

I. Chlorination: Refer to Section 22 05 00.

3.10 INSTALLATION - STORM DRAINAGE PIPING SYSTEMS

A. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

B. Install horizontal rain water conductors to allow for insulation. Refer to Section 22 07 00.

C. Cast iron pipe, fittings and standard couplings: Installed, supported and restrained using the installation procedures detailed in ASTM C1277.

D. Cast iron pipe, fittings and heavy duty couplings: Installed, supported and restrained using the installation procedures detailed in ASTM C1540.

E. Limit above grade plastic drain and vent piping to 35-feet total length.
   1. Support at increments not to exceed those allowed by the Minnesota Plumbing Code.

3.11 VALVE INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.

B. Install uniform length nipple and threaded fittings on both sides of solder end valves. Install union on one side of valve if union or flange is not located within 5 feet for other service reasons.

C. Install 3/4-inch hose-end ball valves with threaded cap for drains at low points of piping, bases of vertical risers, and at equipment.

D. Install branch isolation valves where the branch piping is equal to or larger than half the upstream main pipe size. This does not apply to mains smaller than 1-1/2 inch.

E. Install valves with clearance for installation of insulation.

F. Locate valve to be accessible through access panels where valves are installed above gypsum or plaster ceilings and chases. Coordinate size and location of access doors.

G. Refer to Section 22 07 00 for insulation requirements for valves.

3.12 FIRESTOPPING SCHEDULE

A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10-inch water gauge minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings not less than 1 hour:
   1. Wall Penetrations: Fire F-Ratings not less than 1 hour.
   2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings not less than 1 hour:
      a. Floor Penetrations Within Wall Cavities: T-Rating is not required.

B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion:
   1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of 3 stories.

2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of 2 stories.

C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve 1 hour fire resistant rating for assembly in which joint is installed.

D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10-inch water gauge minimum positive pressure differential to achieve one hour fire resistant rating for floor assembly.

E. Surface Burning Characteristics: Maximum 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.

3.13 HANGER SCHEDULE

PIPE HANGER SPACING		
PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
Cast Iron (All Sizes)	5	5/8
Cast Iron (All Sizes) w/10 foot pipe length	10	5/8
Copper Tube, 1-1/4 inches and smaller	6	1/2
Copper Tube, 1-1/2 inches and larger	10	1/2
PVC (All Sizes)	Per Plumbing Code	3/8
Steel, 3 inches and smaller	12	1/2
Steel, 4 inches and larger	12	5/8

A. Note for Cast Iron Pipe: Locate a hanger within 18 inches of each joint. Also provide hanger at each change of direction and each branch connection.

B. Select hangers for insulated piping to surround the insulation and pipe saddle.

3.14 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment. Refer to Section 03 30 00.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports using steel members, formed steel channel, angle iron or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

3.15 INSTALLATION - HANGERS AND SUPPORTS

A. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

B. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

C. Fastener System Installation:
   1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
   2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

3.16 VALVE APPLICATIONS

A. Install gate valves in domestic water systems to isolate branch piping 2-1/2 inch and larger.

B. Install ball valves for shut-off service and to isolate equipment, part of systems, or vertical risers.

C. Install ball valves in domestic water systems to isolate branch piping 2 inch and smaller.

D. Install shutoff and drain valves at locations indicated on Drawings and/or specified herein.

3.17 VALVE IDENTIFICATION

A. Provide a typewritten list identifying numbered valves. Include valve number, service, location and area served.

B. Plumbing stop valves at fixtures are exempt from valve tagging and inclusion on the valve list.

C. Include a copy of the valve identification list in each maintenance manual.

D. Post one framed copy under acrylic glazing in the mechanical room or other owner designated location.

3.18 STENCILS

A. Clean cut symbols and letters of following size:
   1. Up to 2 Inches Outside Diameter of Insulation or Pipe: 1/2 inch high letters.
   2. 2-1/2 to 6 Inches Outside Diameter of Insulation or Pipe: 1 inch high letters.
   3. Over 6 Inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.
   4. Plumbing Equipment: 1-3/4 inches high letters.

B. Stencil Paint: Semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

3.19 PIPE IDENTIFICATION

A. Use pressure sensitive labels, pre-formed markers or stenciling.

B. Include labeling of service, direction of flow and tape bands at each end of labels with approved colors.

C. For Screen Rooms, Chemical Storage Rooms, Mechanical Rooms, Equipment Room and other spaces, provide tags satisfying the Plumbing Code:
   1. "SAFE WATER" tags on cold water, hot water and circulating hot water piping.
   2. "NONPOTABLE WATER" tags on piping downstream of RPZ backflow preventers.
   3. “NONPOTABLE WATER” tags on all outlets, hydrants, and hosebibbs served by non-potable water.

D. Provide pipe identification for exposed piping within the building and in accessible concealed spaces, such as above lay-in ceilings and at access panels. Minimum locations:
   1. At not more than 30 foot intervals on straight runs of pipes.
   2. Wherever a pipe turns 90 degrees.
   3. Wherever a pipe passes through a wall, on both sides.
   4. At other locations deemed necessary for ease of maintenance, e.g. access panels.

E. Piping that does not require identification:
   1. Fixture supplies.
   2. Below grade piping.
   3. Inaccessible piping concealed in chase walls.
   4. P-traps.
   5. Indirect waste piping from kitchen equipment.
   6. Fire sprinkler piping.

F. Abbreviations: label the piping as follows:

1.	Condensate Drain	CD
2.	Domestic Cold Water (Softened)	CW
3.	Domestic Hot Water	HW
4.	Domestic Circulating Hot Water	CHW
5.	Hard Water	HARD W
6.	Non-Potable Water	NON-POT WTR
7.	Storm Drainage	RWL

3.20 EQUIPMENT IDENTIFICATION

A. Provide identification labels for scheduled equipment (except drains and plumbing fixtures) permanently affixed to equipment with mechanical fasteners (rivets, screws, bolts or other approved methods) in a prominent location.

B. Install labels level and drawn tight to the equipment surface. Provide backing or back-up plates where required by the fastening devices. On pumps and similar small equipment, the label may be located on the wall adjacent to the equipment.

C. Spell out the description of each piece of equipment (Water Heater #1, for example).

3.21 CHLORINATION OF DOMESTIC WATER LINES

A. Chlorination of Domestic Water Lines: Clean domestic water system in building, disinfect system in accordance with governing codes and State Health Department Requirements, and flush entire system clean with potable water:

1. Flush the piping system with clean, potable water until no dirty water appears at the points of outlet.
2. Isolate portion of system to be chlorinated.
   a. Fill with a water-chlorine solution containing at least 50 parts per million of chlorine and allow to stand for 24 hours or
   b. Fill with a water-chlorine solution containing at least 200 parts per million of chlorine and allow to stand for 3 hours.
3. Following the standing time, flush with clean potable water until no chlorine remains in the water coming from the system.
4. Provide written certification to Architect/Engineer that chlorination and flushing of domestic water system has been completed.

3.22 CLEANING

A. Maintain areas free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash from site periodically and dispose off-site; do not burn or bury.

E. Refer to Section 01 70 00: Requirements for cleaning.

END OF SECTION

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SECTION 22 07 00

PLUMBING INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Plumbing piping insulation, jackets and accessories.
   2. Plumbing equipment insulation, jackets and accessories.

B. Related Sections:
   1. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
   2. Section 09 91 00 - Painting and Coating: Execution requirements for painting insulation jackets and covering specified by this section.

1.02 REFERENCES

A. ASTM International (ASTM):
   1. C547 - Standard Specification for Mineral Fiber Pipe Insulation.
   2. C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
   3. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   4. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   5. C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
   6. C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
   7. C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
   8. C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
   9. C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
   10. D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
   11. E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
   12. E2231 - Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics.

B. National Fire Protection Association (NFPA):
   1. 255 – Standard Method of Test of Surface Burning Characteristics of Building Materials.

C. Underwriters Laboratories, Inc. (UL):
   1. -723 – Tests for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

1.04 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84, UL-723, and NFPA 255.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

D. Insulation accessories, such as adhesives, mastics, cement, tapes and glass cloth shall have the same component rating as listed in Paragraph 1.02 of this Section.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years experience.

B. Applicator: Company specializing in performing Work of this section with minimum 3 years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 01 60 00: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00: Environmental conditions affecting products on site.

B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

C. Maintain temperature before, during, and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:
   1. CertainTeed.
   2. Knauf.
   3. Johns Manville.

4. Owens-Corning.

B. Manufacturers for Closed Cell Elastomeric Insulation Products:
1. Aeroflex, Aerocell.
2. Armacell, LLC, Armaflex.
3. Nomaco, K-Flex.

2.02 PIPE INSULATION

A. Type P-1: ASTM C547, molded glass fiber pipe insulation:
1. Thermal Conductivity: 0.23 at 75 degrees F.
2. Operating Temperature Range: 0 to 850 degrees F.
3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil Kraft with self-sealing adhesive joints.
4. Jacket Temperature Limit: Minus 20 to 150 degrees F.

B. Type P-2: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular:
1. Thermal Conductivity: 0.27 at 75 degrees F.
2. Operating Temperature Range: Minus 70 to 180 degrees F.

2.03 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:
1. ASTM C921, white kraft paper with glass fiber yarn, bonded to aluminized film.
2. Water Vapor Permanence: ASTM E96/E96M; 0.02 perms.

B. PVC Plastic Pipe Jacket:
1. Product Description: ASTM D1784, 1-piece molded type fitting covers and sheet material, off-white color.
2. Thickness: 15 mil.
3. Connections: Brush on welding adhesive or pressure sensitive color matching vinyl tape. Closed-cell foam tubing insulation.

C. Connections: Brush on welding adhesive or pressure sensitive color matching vinyl tape. closed-cell foam tubing insulation.

2.04 PIPE INSULATION ACCESSORIES

A. Adhesives and mastic: Compatible with insulation and jacket materials.

B. Piping 1-1/2 Inches Diameter and Smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.

2.05 EQUIPMENT INSULATION

A. TYPE E-1: ASTM C553; glass fiber, flexible or semi-rigid, noncombustible.
1. Thermal Conductivity: 0.023 at 75 degrees F.
2. Operating Temperature Range: 0 to 450 degrees F.
3. Density: 2.3 pound per cubic foot.

2.06 EQUIPMENT INSULATION JACKETS

A. Vapor Retarder Jacket:

1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

B. Field Applied Glass Fiber Fabric Jacket System:
1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
2. Glass Fiber Fabric:
   a. Cloth: Untreated; 9 oz/sq yd weight.
   b. Blanket: 1.0 lb/cu ft density.
   c. Weave: 5 x 5.
3. Indoor Vapor Retarder Finish:
   a. Cloth: Untreated; 9 oz/sq yd weight.
   b. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.07 EQUIPMENT INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Adhesives: Compatible with insulation.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

F. Adhesives: Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00: Coordination and project conditions.

B. Verify piping and equipment has been tested before applying insulation materials.

C. Verify surfaces are clean and dry, with foreign material removed.

3.02 GLASS FIBER INSULATION WITH AP JACKET

A. Insulate piping with fiberglass insulation and all purpose jacket:
1. Apply insulation to clean piping. Verify that insulation is correct size to snugly fit around exterior of specific piping material to be insulated. Apply mastic to piping to temporarily secure insulation to pipes when jacket is not permanently affixed to outside of insulation system.
2. Seal jackets and end laps with mastic applied to 2 surfaces or with self-sealing type lap system. Seal exposed ends of insulation with a full coat of mastic.
3. Fittings, valve bodies and flanges for pipe sizes 4 inches and smaller shall be finished with mineral fiber cement to same thickness as adjacent pipe insulation.
4. Fittings, valve bodies, roof drain bodies and flanges for pipes over 4 inches shall be insulated with 3/4-lb. density fiberglass blanket compressed to the same thickness as adjacent pipe insulation, or mitered pipe insulation segments, or pre-molded fittings

secured with 3-ply jute twine, fiberglass tape or 18-gauge galvanized steel wire, and finished with a smooth coat of mineral fiber cement.
5. After the cement is dry, fittings shall be finished with 4-oz. canvas adhered with permanent adhesive.
6. Fittings shall be sealed with vapor barrier mastic over the canvas for the following piping systems:
   a. Domestic Cold Water (Hard and Soft Water).
   b. Condensate Drain.

3.03 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Insulation shall be applied in accordance with the manufacturer's published recommendations, unless otherwise specified.

C. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of 1 hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than 1 hour.

D. Plumbing Vents:
1. Install insulation continuously through roof penetrations.
   a. Extend insulation 3 feet into heated envelope.
   b. Seal penetrations with flashing sealant.
   c. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   d. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   e. Seal jacket to roof flashing with flashing sealant.

E. Roof Drain Piping:
1. Pipes connected to storm drain: Insulate horizontal roof drain piping, including roof drain bodies, and fittings from roof drain bodies to vertical pipe.
2. Pipes terminating in downspout or scupper: Insulate roof drain piping, including roof drain bodies, and fittings.
3. Cover with aluminum jacket.
4. Contour insulation to drain body. Cut fiber glass board away from the jacket to form a flap for the butt seams and break away 2 fiber glass board sections to form a flap for the lap seams. Secure all edges and flaps with adhesive and seal joints with matching tape.
5. Size insulation large enough to enclose pipe and heat tracer.
6. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water.

F. Piping Systems Conveying Fluids Below Ambient Temperature:
1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

G. Glass Fiber Board Insulation:
1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.

H. Hot Piping Systems less than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
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.
3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.

I. Hot Piping Systems greater than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
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.
3. Insulate flanges and unions at equipment.

J. Inserts and Shields:
1. Piping 1-1/2 Inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
2. Piping 2 Inches Diameter and Larger: Install insert between support shield and piping and under finish jacket:
   a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
   b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces less than 10 feet above finished floor: Finish with PVC jacket and fitting covers or aluminum jacket.

L. Piping Exterior to Building: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.

M. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

N. Prepare pipe insulation for finish painting. Refer to Section 09 91 00.

3.04 INSTALLATION - EQUIPMENT

A. Factory Insulated Equipment: Do not insulate.

B. Exposed Equipment: Locate insulation and cover seams in least visible locations.

C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

D. Equipment Containing Fluids Below Ambient Temperature (roof drain bodies):
   1. Insulate entire equipment surfaces.
   2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
   3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
   4. Finish insulation at supports, protrusions, and interruptions.

E. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.

F. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

G. Prepare equipment insulation for finish painting. Refer to Section 09 91 00.

3.05 PAINTING

A. Prepare exposed, unfinished pipe, fittings, supports, insulation, jackets, and accessories ready for finish painting.

B. Refer to Section 09 91 00.

C. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint.
   1. Finish Coat Material: Exterior/Interior, flat, latex.

3.06 SCHEDULES

A. Plumbing Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS Inches
[2020 energy code up to 140F] Domestic Hot Water Supply and Recirculation	P-1	1-1/4 inches and smaller 1-1/2 inches and larger	1.0 1.5
[2020 energy code up to 200F] Domestic Hot Water Supply and Recirculation	P-1	1-1/4 inches and smaller 1-1/2 inches and larger	1.5 2.0
[MN Plumbing Code 2020] Domestic Hot Water Supply and Recirculation	P-1	1 inch and smaller 1-1/4 inches to 1-1/2 inches 2 inches and larger	1.0 1.5 2.0
Domestic Hot Water Supply and Recirculation systems with domestic water temperature maintenance cable	P-1	1 inch and smaller 1-1/4 inches to 1-1/2 inches 2 inches and larger	1.0 1.5 2.0
Domestic Cold Water (Hard and Soft Water)	P-1	1-1/4 inches and smaller 1-1/2 inches and larger	0.5 1.0

B. Equipment Insulation Schedule:

EQUIPMENT	INSULATION TYPE	INSULATION THICKNESS inches
Roof Drain Bodies	E-1	1.0
Domestic Hot Water Storage Tanks (not factory insulated)	E-1	1.5

END OF SECTION

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SECTION 22 11 00

FACILITY WATER DISTRIBUTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Hose bibs.
   2. Wall Hydrants.
   3. Water hammer arrestors.
   4. Domestic hot water circulating pumps.
   5. Thermostatic mixing valves.
   6. Trap Primers
   7. Chlorination.

B. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of concrete house keeping pads specified by this Section.
   2. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this Section.
   3. Section 08 31 13 - Access Doors and Frames: Product requirements for access doors for placement by this Section.
   4. Section 09 91 00 - Painting and Coating: Product and execution requirements for painting specified by this Section.
   5. Section 22 05 00 – Common Work Results for Plumbing:
      a. Administrative procedures:
         1) Submittals.
         2) Quality Assurance.
         3) Delivery Storage and Handling.
      b. Hangers and supports.
      c. Flashing and Sleeves.
      d. Firestopping.
      e. Pipe and equipment identification.
      f. Installation requirements for piping materials applying to various systems.
      g. Cleaning.
   6. Section 22 07 00 - Plumbing Insulation: Execution requirements for insulated pipes.
   7. Section 26 27 26 - Wiring Devices: Execution requirements for electric connections to equipment specified by this Section.

1.02 REFERENCES

A. American National Standards Institute (ANSI):
   1. Z358.1 - Emergency Eyewash and Shower Equipment.

B. American Society of Mechanical Engineers (ASME):
   1. B16.3 - Malleable Iron Threaded Fittings.
   2. B16.4 - Gray Iron Threaded Fittings.
   3. B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
   4. B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

5. B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
6. B31.9 - Building Services Piping.
7. B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.

C. American Society of Sanitary Engineering (ASSE):
1. 1010 - Performance Requirements for Water Hammer Arresters.
2. 1011 - Performance Requirements for Hose Connection Vacuum Breakers.
3. 1012 - Performance Requirements for Backflow Preventer With Intermediate Atmospheric Vent.
4. 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
5. 1019 - Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type.
6. 1052 – Performance Requirements for Hose Connection Backflow Preventer, Field Testable.
7. 1053 – Performance Requirements for Double check Backflow Prevention, Wall Hydrants, Field Testable.

D. ASTM International (ASTM):
1. A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. A536 - Standard Specification for Ductile Iron Castings.
3. B88 - Standard Specification for Seamless Copper Water Tube.
4. B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
5. D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
6. D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
7. D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
8. D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
9. D2855 - Standard Practice for Making Solvent-Cemented Joints With Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
10. F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
11. F 891 - Standard Specification for Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core.
12. F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

E. American Welding Society (AWS):
1. A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. American Water Works Association (AWWA):
1. C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
2. C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
3. C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
4. C600 - Standard for Installation of Ductile-Iron Water Mains and their Appurtenances.
5. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 inches through 12 inches, for Water Distribution.

6. C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inches through 3 inches, for Water Service.
7. C950 - Fiberglass Pressure Pipe.
8. M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

G. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:
1. SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. SP 67 - Butterfly Valves.
3. SP 69 - Pipe Hangers and Supports - Selection and Application.
4. SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
5. SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
6. SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
7. SP 80 - Bronze Gate, Globe, Angle and Check Valves.
8. SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded.
9. SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
10. SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

H. National Electrical Manufacturers Association (NEMA):
1. 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

I. National Sanitation Foundation International (NSF):
1. 61 - Drinking Water System Components - Health Effects.

J. Plumbing and Drainage Institute (PDI):
1. WH201 - Water Hammer Arrester Standard.

1.03 SUBMITTALS

A. Product Data:
1. Piping: Submit catalog information on pipe materials, fittings, and accessories.
2. Valves:
a. Submit manufacturers catalog information with valve data and ratings for each service.
b. Identify valve application in the submittal.
3. Domestic Water Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
4. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

B. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves and equipment.
1. Submit certification of water disinfection and chlorination.

B. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.05 QUALITY ASSURANCE

A. For drinking water service, provide valves complying with NSF 61.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum 3 years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00: Product storage and handling requirements.

B. Accept valves and equipment 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.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00.

B. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Refer to Section 22 05 00.

2.02 DOMESTIC WATER PIPING, ABOVE GRADE

A. Refer to Section 22 05 00.

2.03 INTERIOR HOSE BIBBS

A. Manufacturers:
   1. Chicago Faucet.
   2. Josam.
   3. Nibco.
   4. Smith.

5. Woodford.
6. Zurn.

B. 3/4 inch: 125 psi, CWP, copper to hose, bronze body, angle type, vacuum breaker on hose outlet. NIBCO Fig. 72VB, or approved equal.

C. 1-1/2-inch: 175 psi, cast brass body, straight type, hand wheel. Potter Roemer 4110, or approved equal.

2.04 WALL HYDRANTS (HB-1)NOT FREEZE PROOF

A. Manufacturers:
1. Chicago Faucet.
2. Josam.
3. Nibco.
4. Smith.
5. Woodford.
6. Zurn.

B. ASSE 1019; bronze wall plate hose thread spout, and removable key operator, vacuum breaker. [Rough][Polished][chrome][bronze] finish. Woodford Model 84 (surface mounted). Woodford Model B74 (recessed box)

2.05 EXTERIOR WALL HYDRANTS (HB-2) (FREEZE-PROOF)

A. Manufacturers:
1. Chicago Faucet.
2. Josam.
3. Nibco.
4. Smith.
5. Woodford.
6. Zurn.

B. ASSE 1019; non-freeze, self-draining type with bronze wall plate hose thread spout, and removable key operator, vacuum breaker. [Rough][Polished][chrome][bronze] finish. Woodford Model 67 (surface mounted). Woodford Model B67 (recessed box)

2.06 WATER HAMMER ARRESTORS

A. Manufacturers:
1. Josam.
2. Precision Plumbing Products
3. Sioux Chief.
4. Smith.
5. Zurn.

B. Josam Series 7500, or approved equal, stainless steel construction, bellows type sized in accordance with PDI WH-201.
   1. Barrel-piston type water hammer arresters with hard drawn copper barrel, brass piston and "O" rings, seal lubricant, pre-charged permanently sealed air cushion and male IPS plug. Arresters shall be designed for 150 PSI working pressure and PDI certified.

2.07 DOMESTIC HOT WATER CIRCULATING PUMP

A. Manufacturers and Models:
   1. Armstrong ARMflo E**B series.
   2. Bell and Gossett Series PL-**B.
   3. Taco 1400-**B Series.

B. Construction:
   1. Body: Bronze, inline design, with flange piping connections; 150 psi working pressure.
   2. Shaft: Horizontal, carbon steel, alloy steel or stainless steel.
   3. Impeller: 30 percent glass filled Noryl or similar polymer.
   4. Bearings: Permanently oil lubricated, maintenance free.
   5. 120 volt, single phase motor with overload protection.

2.08 BALANCING VALVES

A. Refer to Section 22 05 00.

2.09 PIPE HANGERS AND SUPPORTS

A. Refer to Section 22 05 00.

2.10 THERMOSTATIC MIXING VALVE

A. Manufacturers:
   1. Bradley.
   2. Lawler.
   3. Powers.

B. Emergency Fixture Application features:
   1. Positive shut-off upon failure of cold water supply.
   2. Integral cold water bypass.
   3. High-low capability to serve eyewash flow or shower flow.
   4. Inlet thermometers and outlet thermometer.
   5. Emergency Shower/Eyewash, basis of design: Lawler model 911 Unit No. 8334.
   6. Emergency Eyewash only, basis of design: Lawler model 911E/F
   7.

2.11 TRAP PRIMER

A. Manufacturers:
   1. MIFAB, Inc.
   2. Precision Plumbing Products, Inc.
   3. Sioux Chief Manufacturing Company, Inc.
   4. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   5. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

B. Construction: ASSE 1018, lead free bronze body, chrome plated finish where exposed, ½" inlet and outlet connections. 125 psi rated pressure, 25 psi minimum system pressure, 10 psi pressure drop to operate.
   1. Provide distribution

C. Basis of Design: Watts LFTP300

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00: Coordination and project conditions.

B. Verify 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.

3.03 INSTALLATION

A. Pipe and fittings: Refer to Section 22 05 00.

B. Valves: Refer to Section 22 05 00.

C. Hose bibs: Provide vacuum breakers where directed by the Plumbing Inspector.

D. Wall Hydrants:
   1. Insulate piping through the wall and maintain the integrity of the vapor barrier.
   2. Apply sealant to wall surface behind the wall hydrant.

E. Backflow preventers:
   1. Register installation with the Department of Labor and Industry.
   2. Extend drain piping from funnel to floor drain.
   3. Provide RPZ for heating system fill line.
   4. Provide RPZ for ice resurfacer water supply.

F. Water hammer arrestors: Install with shut-off valve and threaded fitting.

G. Domestic hot water circulating pumps: Install in accordance with detail. Control pump through 7 day timer and line voltage aquastat unless indicated otherwise.

H. Balancing valves: Refer to Section 22 05 00.

I. Thermostatic mixing valves:
   1. Set outlet temperature limit to not exceed 115 degrees F.
   2. Set outlet temperature limit to not exceed 85 degrees F for emergency fixtures.

J. Trap Primer: Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.04 INSTALLATION - HANGERS AND SUPPORTS

A. Install hangers and supports in accordance with Section 22 05 00.

3.05 INSTALLATION – BURRIED PIPING SYSTEMS

A. Verify connection size, location, and inverts are as indicated on Drawings.

B. Coordinate underground piping locations with structural footings.

C. Establish elevations of buried domestic water piping with not less than 7.5-feet of cover outside of building.

D. Establish minimum separation of 10 feet from water piping in accordance with Minnesota code.

E. Remove scale and dirt on inside of piping before assembly.

F. Excavate pipe trench in accordance with Division 31.

G. Install pipe to elevation as indicated on Drawings.

H. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted loose depth; compact to 95 percent maximum density.

I. Install pipe on prepared bedding.

J. Route pipe in straight line.

K. Pipe Cover and Backfilling:
   1. Backfill trench in accordance with Division 31.
   2. Maintain optimum moisture content of fill material to attain required compaction density.
   3. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 6 inches compacted layers to 12 inches minimum cover over top of jacket. Compact to 95 percent maximum density.
   4. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
   5. Do not use wheeled or tracked vehicles for tamping.

3.06 INSTALLATION - ABOVE GROUND PIPING

A. Refer to Section 22 05 00 - Common Work Results for Plumbing for additional requirements.

B. Install 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 without interfering with use of space or taking more space than necessary.

E. Group piping whenever practical at common elevations.

F. Install piping level, or slope piping and arrange to drain at low points.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 00.

H. Provide access where valves and fittings are not accessible.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Provide support for utility meters in accordance with requirements of utility companies.

K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.

L. Install domestic water piping in accordance with ASME B31.9.

M. Sleeve pipes passing through partitions, walls and floors. Refer to Section 22 05 00.

N. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Section 07 84 00.

O. Install unions downstream of valves and at equipment or apparatus connections.

P. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

Q. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

R. Provide flow controls in water circulating systems as indicated on Drawings.

S. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, irrigation systems.

T. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.

U. Test backflow preventers in accordance with ASSE 5013.

V. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping.

3.07 INSTALLATION - SERVICE CONNECTIONS

A. Verify connection size, location, and inverts are as indicated on Drawings.

B. Coordinate underground piping locations with structural footings.

C. Provide mechanical sleeve seal for wall penetrations. Anchor service main to concrete.

D. Establish elevations of buried piping with not less than 7.5 feet of cover.

3.08 FIELD QUALITY CONTROL

A. Section 01 40 00: Field inspecting, testing, adjusting, and balancing.

B. Test domestic water piping system in accordance with applicable code or local authority having jurisdiction.

C. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
   1. Increase pressure in 50-psi increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psi. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

D. Disinfect water piping per Section 22 05 00.

3.09 PIPING TESTS

A. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

B. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

C. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

D. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

E. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

F. Prepare reports for tests and for corrective action required.

3.10 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash from site periodically and dispose off-site; do not burn or bury.

3.11 CLEANING

A. Refer to Section 01 70 00.

B. Refer to Section 22 05 00.

END OF SECTION

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SECTION 22 13 00

FACILITY SANITARY SEWERAGE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Sanitary Drainage Specialties:
      a. Floor drains.
      b. Trench drains.
      c. Cleanouts.

B. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of concrete specified by this section.
   2. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
   3. Section 08 31 13 - Access Doors and Frames: Product requirements for access doors for placement by this section.
   4. Section 22 05 00 – Common Work Results for Plumbing: Product and installation requirements for piping materials applying to various systems.
   5. Section 26 27 26 - Wiring Devices: Execution requirements for electric connections to equipment specified by this section.

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):
   1. A112.6.3 – Floor and Trench Drains.
   2. B31.9 - Building Services Piping.

B. American Society for Testing Materials (ASTM):
   1. A74 - Standard specification for cast iron soil pipe and fittings.
   2. C564 - Standard specification for rubber gaskets for joining cast iron soil pipe and fittings.

C. Cast Iron Soil Pipe Institute (CISPI):
   1. 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
   2. 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

1.03 SUBMITTALS

A. Section 01 33 00: Submittal procedures.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes for sewage-ejectors, and manholes.

C. Product Data:

1. Sanitary Drainage Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
2. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 70 00: Closeout procedures.

B. Project Record Documents: Record actual locations of equipment and clean-outs.

C. Operation and Maintenance Data: Submit frequency of treatment required for interceptors. Include, spare parts lists, exploded assembly views for pumps and equipment.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with State of Minnesota standards.

B. Maintain one copy of each document on site.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years experience.

B. Installer: Company specializing in performing Work of this section with minimum 3 years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00: Product storage and handling requirements.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00.

B. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 FLOOR DRAINS

A. Acceptable Manufacturers:

1. Jay R. Smith.
2. Josam.
3. Wade.
4. Watts.
5. Zurn.

B. Construction:
1. ASME A112.21.1.
2. Coated cast iron body.
3. Flashing collar with threaded strainer connection.
4. Drainage flange.

C. Basis of Design:
1. Floor Drain (FD-1): Josam 30000-A series, with 4-inch satin finish bronze strainer, bottom outlet.
2. Shower Drain (FD-2): Josam 30802-4CP series, with 4-inch round Nikaloy strainer, invertible flashing collar, weepholes, and 2" low-profile trap.
3. Floor Drain (FD-3): Josam 30000-A series with 4-inch Nikaloy strainer, bottom outlet.
4. Condensate Drain (FD-4): Josam 30000-A-E2 series with satin finish bronze strainer with 4-inch diameter funnel, bottom outlet.

D. Floor Drain (FD-5):
1. ASME A112.21.1.
2. Coated cast iron two-piece body.
3. Double drainage flange with perimeter drainage slots.
4. Loose set anti-tilt grate.
5. Bottom outlet.
6. Josam 32100 or 32200 Series with 8-inch cast iron strainer.

2.02 TRENCH DRAINS (TD) (SLP FIRE STATION APPARATUS BAY DRAINS)

A. Acceptable Manufacturers:
1. Dura-Trench
2. Jay R. Smith.
3. Josam.
4. Wade.
5. Watts.
6. Zurn.

B. Trench Drain (TD):
1. Josam 76000 Series 6 inches wide by 39 inches long with Nickaloy Grate.
2. Coated cast iron rectangular sections with heavy-duty body and integral anchor flange.
3. Heavy-duty loose-set ductile iron grates with perimeter drainage slots.
    a. Load rating: [light duty, 2000 lb rating] [medium duty, 4000 lb rating, DIN Class A] [heavy duty, 7500 lb rating, DIN Class C] [extra heavy duty, 10,000 lb rating, H-20 load rating, DIN class E] [special duty, over 10,000 lb rating, DIN Class F]
4. Secondary loose-set dome strainer and bottom inside caulk outlet connection.

C. Provide extensions necessary to match size indicated on the Drawings.

2.03 TRENCH DRAINS (LINEAR PRECAST)

A. Manufacturers:
1. Dura-Trench (xxxx)
2. Smith/ACO (9814).
3. Polycast (600 Series with DG0647 grate and DA05425 hold down device).
4. Watts (Dead Level D-SS-FS).
5. Zurn (Z806-HDS-U4-RFS-VP).

B. Trench Drain (TD-1):
1. Trench: 6 inches wide by 48 inches long, pre-sloped.
2. Channel: UV stabilized, fiberglass reinforced polymer, polymer concrete or polypropylene.
3. Frame: Stainless steel or ductile iron with Stainless Steel Frame Guard.
4. Outlet: Integral 4 inch side [bottom] outlet.
5. Grate: xxx [Light Duty, 2,000 lb rating, DIN Class A] [medium duty, 4,999 lb rating, DIN Class B] [heavy duty, 7,499 lb rating, DIN Class C]
6. Grate: Slotted Load rating: extra heavy duty, 10,000 lb rating, H-20 load rating, DIN class E [special duty, over 10,000 lb rating, DIN Class F]
7. Accessories: Provide frame anchors, grate lockdowns and construction covers.

C. Trench Drain (TD-2)
1. Trench: 12 inches wide by 48 inches long, pre-sloped.
2. Channel: UV stabilized, fiberglass reinforced polymer, polymer concrete or polypropylene.
3. Frame: Stainless steel or ductile iron with Stainless Steel Frame Guard.
4. Outlet: Integral 4 inch side outlet.
5. Grate: Slotted Load rating: extra heavy duty, 10,000 lb rating, H-20 load rating, DIN class E [special duty, over 10,000 lb rating, DIN Class F]
6. Accessories: Provide frame anchors, grate lockdowns and construction covers.

D.

E. Provide extensions necessary to match size indicated on the Drawings.

2.04 CLEANOUTS

A. Acceptable Manufacturers:
1. Jay R. Smith.
2. Josam.
3. Wade.
4. Watts.
5. Zurn.

B. Floor Cleanout (CO): Provide Josam Series 58580-1 series, or equal, with satin finish bronze top and carpet cleanout marker where appropriate. Provide chrome cover when located in a wall.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00: Coordination and project conditions.

B. Verify excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Verify elevations with site utility work prior to commencing work.

B. Remove scale and dirt, on inside and outside of pipe before assembly. Remove burrs.

C. Protect open ends of pipe from dirt and debris using temporary plugs or caps.

3.03 GENERAL INSTALLATION

A. Pitch drain, waste, and vent piping 1/4 inch per foot minimum. Do not slope more than 1/2 inch per foot.

B. Support piping so it will not sag.

C. Follow manufacturer's installation instructions for neoprene gasket connections to specialties.

D. Install top of hubs below finish floor when masonry partition wall thickness is insufficient to conceal hub and/or outside diameter of hub is greater than stud width.

E. Install an approved expansion joint at intervals not to exceed 35 feet for vertical plastic piping.

F. Floor Drains: Install accurately where indicated on the drawings:
   1. Install with top set level with finished floor, unless indicated otherwise.
   2. Trap and vent as required by local code authority.

G. Cleanouts: Install full size at the following locations:
   1. Base of waste stacks.
   2. Ninety degree turns in mains.
   3. Point where sewer leaves building.
   4. All other necessary points as indicated and required to permit easy system rodding:
      a. Every 50 feet on lines 3 inches or less in size.
      b. Every 100 feet on lines 4 inches or more in size.

H. Encase exterior cleanouts in concrete flush with grade.

I. Install floor cleanouts at elevation to accommodate finished floor.

3.04 INSTALLATION - HANGERS AND SUPPORTS

A. Refer to Section 22 05 00.

3.05 INSTALLATION - BURIED PIPING SYSTEMS

A. Verify connection size, location, and inverts are as indicated on Drawings.

B. Coordinate underground piping locations with structural footings.

C. Establish elevations of buried piping with not less than 6.5 feet of cover.

D. Establish minimum separation of 10 feet from water piping in accordance with Minnesota code.

E. Remove scale and dirt on inside of piping before assembly.

F. Excavate pipe trench in accordance with Division 31.

G. Install pipe to elevation as indicated on Drawings.

H. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted loose depth; compact to 95 percent maximum density.

I. Install pipe on prepared bedding.

J. Route pipe in straight line.

K. Pipe Cover and Backfilling:
   1. Backfill trench in accordance with Division 31.
   2. Maintain optimum moisture content of fill material to attain required compaction density.
   3. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 6 inches compacted layers to 12 inches minimum cover over top of jacket. Compact to 95 percent maximum density.
   4. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
   5. Do not use wheeled or tracked vehicles for tamping.

3.06 INSTALLATION - ABOVE GROUND PIPING

A. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom. Do not spread piping, conserve space.

E. Group piping whenever practical at common elevations.

F. Provide access where valves and fittings are not accessible.

G. Increase vent stacks to 3 inches in diameter (minimum) for vents extending through the roof.

H. Install vent piping penetrating roof with frost proof jackets having air space of at least 1-inch between outside surface of pipe and inside surface of frost proof jacket.

I. Install piping penetrating roofed areas to maintain integrity of roof assembly.

J. Construct the roof jacket with a roof flange of 16 ounce copper or sheet lead of not less than 4 pounds per square foot. Maintain separation from fresh air intakes indicated on the drawings but not less than 10 feet horizontal.

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. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 91 00.

M. Install bell and spigot pipe with bell end upstream.

N. Sleeve pipes passing through partitions, walls and floors.

O. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Section 07 84 00.

P. Support cast iron drainage piping at every joint.

3.07 FIELD QUALITY CONTROL

A. Section 01 40 00: Field inspecting, testing, adjusting, and balancing.

B. Test sanitary waste and vent piping system in accordance with the Sate of Minnesota Rules and Regulations, and local authority having jurisdiction.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash from site periodically and dispose off-site; do not burn or bury.

END OF SECTION

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SECTION 22 14 00

FACILITY STORM DRAINAGE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Roof drains.
   2. Overflow roof drains.
   3. Downspout nozzles.

B. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of concrete specified by this section.
   2. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
   3. Section 08 31 13 - Access Doors and Frames: Product requirements for access doors for placement by this section.
   4. Section 09 91 00 - Painting and Coating: Execution requirements for painting material specified by this section.
   5. Section 22 05 00 – Common Work Results for Plumbing:
      a. Product and installation requirements for piping.
      b. Hangers and supports.
      c. Pipe identification requirements.
   6. Section 22 07 00 - Plumbing Insulation: Product and execution requirements for pipe insulation.
   7. Division 26 – Electrical: Execution requirements for electric connections to equipment specified by this section.

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):
   1. A112.21.2M - Roof Drains.
   2. B31.9 - Building Services Piping.

1.03 SUBMITTALS

A. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes for clear water sump-pumps, catch basins, and manholes.

B. Product Data:
   1. Storm Drainage Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
   2. Clearwater Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

1.04 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of equipment and clean-outs.

B. Operation and Maintenance Data: Submit spare parts lists, exploded assembly views for pumps and equipment.

PART 2 PRODUCTS

2.01 ROOF DRAINS

A. Manufacturers:
1. Jay R. Smith.
2. Josam.
3. Mifab.
4. Zurn.
5. Wade.

B. Roof Drain (RD): Assembly: ASME A112.21.2M. Josam 21500 Series.
1. Body: Coated cast iron, large sump.
2. Dome Strainer: Removable cast iron dome/grate.
3. Membrane flange and membrane clamp ring with integral gravel stop.
4. Deck clamp.

C. Overflow Roof Drain (OD):
1. Similar to roof drain above with internal waterguard cut to 2-inch high. Josam 21500-16 Series.

2.02 DOWNSPOUT NOZZLES

A. Bronze Nozzle Manufacturers:
1. Jay. R. Smith.
2. Josam.
3. Zurn.
4. Wade.

B. Plastic Nozzle Manufacturers:
1. Arkmann
2. End Metal Theft
3. Approved equal

C. Downspout Nozzle (DSN): Provide Josam Series 25010, or equal, cast nickel bronze downspout nozzle, loose wall flange and no-hub or threaded connection. Where rainwater leader terminates through an exterior wall above grade, provide a downspout nozzle, satin bronze finish.

D. Plastic Downspout Nozzle (DSN): PVC or ABS downspout nozzle, loose wall flange and no-hub or solvent joint connection. Basis of design: Arkman PDN.

2.03 CLEANOUTS

A. Acceptable Manufacturers:
   1. Jay R. Smith.
   2. Josam.
   3. Wade.
   4. Watts.
   5. Zurn.

B. Floor Cleanout (CO): Provide Josam Series 58580-1 series, or equal, with satin finish bronze top and carpet cleanout marker where appropriate. Provide chrome cover when located in a wall.

2.04 SUMPS

A. Acceptable Manufacturers:
   1. Brown Minneapolis Tank.
   2. Jackel.
   3. Midwest Tank.
   4. Topp Industries.

B. Cover: Sized for sump diameter with perimeter bolting. 3/8 inch thick steel. Include inspection opening with hinged or bolted cover plate Provide companion ring if not furnished with sump basin. Weil model 8805 and 8816 curb ring.

C. Sump Basin:
   1. Description: 30 inch diameter by 84 inch deep fiberglass or polyethylene sump.
   2. Provide anti-float flange or encase in concrete.

PART 3 EXECUTION

3.01 INSTALLATION - BURIED PIPING SYSTEMS

A. Establish elevations of piping outside the building with not less than 4 feet of cover.

B. Establish minimum separation of sanitary sewer piping and domestic water service piping in accordance with Minnesota State code.

C. Install pipe to elevation as indicated on Drawings.

D. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted loose depth; compact to 95 percent maximum density.

E. Install pipe on prepared bedding.

F. Route pipe in straight line.

G. Coordinate underground piping locations with structural footings.

3.02 INSTALLATION - ABOVE GROUND PIPING

A. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearance at cleanout for snaking drainage system.

C. Install floor cleanouts at top elevation to match finished floor.

D. Route piping in orderly manner, parallel and perpendicular to walls.

E. Install piping to maintain headroom. Group piping to conserve space.

F. Group piping whenever practical at common elevations.

G. Support cast iron drainage piping at every joint.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 07 00.

J. Provide access where valves and fittings are not accessible.

K. Install piping penetrating roofed areas to maintain integrity of roof assembly.

L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 91 00.

N. Install bell and spigot pipe with bell end upstream.

O. Sleeve pipes passing through partitions, walls and floors. Refer to Section 22 05 00.

P. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.

3.01 FIELD QUALITY CONTROL

A. Test storm drainage piping system in accordance with applicable code and local authority having jurisdiction and State of Minnesota Rules and Regulation.

END OF SECTION

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SECTION 22 34 00

FUEL-FIRED DOMESTIC WATER HEATERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Commercial gas-fired water heaters.

B. Related Sections:
1. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for concrete housekeeping pads specified by this section.
2. Section: 22 11 00 - Facility Water Distribution: Supply connections to domestic water heaters.
3. Section 23 11 23 - Facility Natural-Gas Piping: Execution requirements for gas piping connections specified by this section.
4. Division 26 - Electrical: Execution requirements for electric connections specified by this Section.

1.02 REFERENCES

A. American National Standards Institute:
1. ANSI Z21.10.3 - Gas Water Heaters - Vol. III Storage, with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous Water Heaters.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
1. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

C. American Society of Mechanical Engineers:
1. ASME PTC 25 - Pressure Relief Devices.
2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.

D. International Code Commission:
1. International Fuel Gas Code (IFGC).

E. National Fire Protection Association:
1. NFPA 54 - National Fuel Gas Code.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:
1. Water Heaters: Submit dimensioned drawings of water heaters indicating components and connections to other equipment and piping. Indicate pump type, capacity and power requirements. Submit electrical characteristics and connection locations.

C. Manufacturer's Installation Instructions: Submit mounting and support requirements.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit replacement part numbers and availability.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3-years experience.

B. Installer: Company specializing in performing Work of this Section with minimum 3-years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Products storage and handling requirements.

B. Accept water heaters on site in original labeled cartons. Inspect for damage.

C. Protect tanks with temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

A. Furnish three year manufacturer warranty for commercial domestic water heaters.

B. Furnish five year manufacturer warranty for domestic hot water storage tanks.

PART 2 PRODUCTS

2.01 COMMERCIAL GAS FIRED WATER HEATERS

A. Acceptable Manufacturers:
   1. A.O. Smith.
   2. Bock.
   3. Bradford-White.
   4. PVI.
   5. Rheem.
   6. State.

B. Type: Vertical storage, tank type, natural gas fired domestic hot water heater.

C. Tank: Glass lined welded steel ASME labeled; multiple flue passages, 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.

D. Controls: Automatic water thermostat with adjustable temperature range from 120 to 180 degrees F. Automatic reset high temperature limiting thermostat factory set at 195 degrees F, gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, flue baffle and draft hood.

E. Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME temperature and pressure relief valve.

2.02 DOMESTIC HOT WATER STORAGE TANK

A. Acceptable Manufacturers:
   1. A.O. Smith.
   2. Bock.
   3. PVI.

B. Description:
   1. Provide A. O. Smith model Tj-80A, vertical domestic hot water storage tank for 120F hot water.
   2. Provide Bradford-White M-3-ST120R5, or equal, vertical domestic hot water storage tank for 120F hot water.

2.03 DOMESTIC HOT WATER HEAT EXCHANGER/TANK

A. Acceptable Manufacturers:
   1. Amtrol.
   2. Hamilton Engineering - Eliminator, HET 76120D.
   3. Peerless.

B. Description:
   1. 119 gallon, insulated, vertical, steel storage tank with steel or poly jacket.
   2. 150 psi working pressure rating for tank and coils.
   3. Bottom cold water inlet connection: One inch MPT.
   4. Top hot water outlet connection: One inch MPT.
   5. ASME stamped Temperature and pressure rated relief valve.
   6. Bottom coil connection: One inch, 25 GPM flow capacity at 7.5 feet head.
   7. Top coil connection: One inch, 11 GPM flow capacity at 2.9 feet head.

C. Performance: 559 Gallon first hour delivery, 50 degree entering water, 90 degree temperature rise. 352 GPH at 120 degree temperature rise, 352 MBH boiler heat supplied at 180 degree E.W.T.

2.04 DIAPHRAGM-TYPE EXPANSION TANKS

A. Provide diaphragm type pressure tanks of the size and capacity shown on the drawings. Precharge to 40 PSI.

B. Provide suitable inlet and outlet tappings.

C. Construct tank of galvanized steel and provide a 100 percent corrosion free NSF approved lining. Provide permanently sealed heavy-duty butyl diaphragm with five year written warranty for entire assembly. Test for 125 psig working pressure. ASME Compliance.

D. Manufacturer: Amtrol Therm-X-Trol, Bell & Gossett, or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Maintain manufacturer's recommended clearances around and over water heaters.

B. Install water heater on concrete housekeeping pad, minimum 3-1/2 inches high and 6 inches larger than water heater base on each side. Refer to Section 03 30 00.

C. Connect natural gas piping in accordance with IFGC.

D. Connect natural gas piping to water heater, full size of water heater gas train inlet. Arrange piping with clearances for burner removal and service.

E. Connect domestic hot water and domestic cold water piping to water heater.

F. Connect domestic circulating hot water line to cold water inlet piping.

G. Install the following piping accessories. Refer to Section 22 11 00.
   1. On cold water inlet piping, downstream of the circulating line connection:
      a. Thermometer well and thermometer.
      b. Strainer.
      c. Pressure gage.
      d. Check valve.
      e. Vacuum relief valve.
      f. Shutoff valve.
      g. Union.
   2. On hot water piping:
      a. Union.
      b. Shutoff valve.
      c. Thermometer well and thermometer.

H. Install the following piping accessories on natural gas piping connections. Refer to Section 23 11 23.
   1. Dirt leg.
   2. Shutoff valve.
   3. Pressure regulator suitable for water heater inlet pressure.

I. Install discharge piping from relief valves and drain valves to nearest floor drain.

J. Install water heater trim and accessories furnished loose for field mounting.

K. Install electrical devices furnished loose for field mounting.

L. Connect flue and combustion air piping to water heater, full size of outlet or larger. Refer to Section 23 51 00.

END OF SECTION

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)SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Water closets.
2. Urinals.
3. Lavatories.
4. Mop sinks.
5. Sinks.
6. Laboratory Sinks
7. Laundry Sinks
8. Showers.
9. Electric water coolers.
10. Outlet Boxes.
11. Emergency Eyewash.
12. Emergency Eyewash/Shower.
13. Hose Reel.
14. Ice Resurfacer Filling Station.

B. Related Sections:
1. Section 07 90 00 - Joint Protection: Product requirements for calking between fixtures and building components for placement by this section.
2. Section 22 05 00 – Common Work Results for Plumbing: Administrative procedures and execution requirements. Explanation of approved manufacturers and prior approvals.
3. Section 22 11 00 - Facility Water Distribution: Supply connections to plumbing fixtures.
4. Section 22 11 00 - Facility Water Distribution: Hose bibbs, hydrants, and wall hydrants.
5. Section 22 13 00 - Facility Sanitary Sewerage: Waste connections to plumbing fixtures.
6. Section 26 27 26 - Wiring Devices: Execution requirements for electric connections to sensor valves and faucets specified by this section.

1.02 REFERENCES

A. American National Standards Institute (ANSI):
1. A117.1 - Accessible and Usable Buildings and Facilities.

B. Air-Conditioning and Refrigeration Institute (ARI):
1. 1010 - Self-Contained, Mechanically Refrigerated Drinking-Water Coolers.

C. American Society of Mechanical Engineers (ASME):
1. A112.6.1 - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use.
2. A112.18.1 - Plumbing Fixture Fittings.
3. A112.19.1 - Enameled Cast Iron Plumbing Fixtures.
4. A112.19.2 - Vitreous China Plumbing Fixtures.
5. A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
6. A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals.

D. American Society of Safety Engineers (ASSE):

1. 1016 - Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations

1.03 SUBMITTALS

A. In accordance with Section 01 33 00.

B. Product Data: Submit catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes. Include water surface area for water closet fixtures.

C. Manufacturer's Installation Instructions: Submit installation methods and procedures.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 70 00: Closeout procedures.

B. Operation and Maintenance Data: Submit fixture, trim, exploded view and replacement parts lists.

1.05 QUALITY ASSURANCE

A. Specified fixtures identify the basis of design and establish the standard of quality for this project. Comparable fixtures from other listed manufacturers are acceptable, providing they meet or exceed the indicated requirements.

B. Water surface area for the water closet fixtures is a salient feature. Fixtures with smaller areas will not be accepted.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00: Product storage and handling requirements.

B. Accept fixtures on site in factory packaging. Inspect for damage.

C. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.01 [ACCEPTABLE] MANUFACTURERS

A. Vitreous China Fixtures: Water Closets, Urinals, Lavatories and Sinks
1. American Standard.

2. Crane.
3. Kohler Co.
4. Sloan.
5. Zurn.

B. Fixture Carriers:
1. Josam.
2. Smith.
3. Wade.
4. Watts.
5. Zurn.

C. Stainless Fixtures: Sinks
1. Advance Tabco.
2. Elkay.
3. Just.
4. Kindred Commercial.

D. Faucets and Trim
1. American Standard.
2. Chicago.
3. Delta.
4. Kohler Co.
5. Speakman.
6. T & S Brass.
7. Zurn.

E. Flush Valves
1. American Standard.
2. Sloan.
3. Toto.
4. Zurn.

F. Molded Stone Fixtures: Mop Sinks
1. Fiat.
2. Florestone.
3. Mustee.
4. Pro Flo.
5. Stern Williams.
6. Zurn.

G. Water Coolers
1. Elkay.
2. Halsey Taylor.
3. Haws.
4. Oasis.

2.02 WATER CLOSET (WC-5 AND WC-5A)[WALL HUNG]

A. American Standard, wall mounted, Afwall FloWise Elongated 1.28 GPF water closet model 3351.101.020; 10 inch by 12 inch water surface.

B. Bowl: ASME A112.19.2M; wall hung, siphon jet, vitreous china closet bowl, with elongated rim, 1-1/2 inch inlet spud, white bolt caps.

C. Sensor Operated Flush Valve: ASSE 1037; High efficiency valve with battery operated solenoid operator, infrared sensor and over-ride button in chrome plated plate, wheel handle stop and vacuum breaker; maximum 1.28 gallon flush volume. Sloan 111 SMO

D. Exposed Sensor Operated Flush Valve: ASSE 1037; High efficiency valve with hard wired solenoid operator, infrared sensor and over-ride button in chrome plated plate, screwdriver stop and vacuum breaker; maximum 1.6 gallon flush volume. Sloan Model 111-1.6 ES-S TMO.

E. Concealed Sensor Operated Flush Valve: ASME A112.18.1; High efficiency chrome plated brass valve with hard wired solenoid operator, infrared sensor and over-ride button. Screwdriver stop and vacuum breaker; maximum 1.28 gallon flush volume. Sloan 152-1.25 ES.

F. Manual Operated Flush Valve: ASSE 1037; Exposed, chrome plated brass, manual operation valve, concealed screwdriver stop and vacuum breaker; maximum 1.6 gallon flush volume. Sloan Royal, 110.

G. Seat: Solid white plastic, open front, extended back, self-sustaining hinge, corrosion resistant bolts, less cover.

H. Wall Mounted Carrier: ASME A112.6.1; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.03 WATER CLOSET (WC-6 AND WC-6A)[WALL HUNG]

A. American Standard Afwall, wall mounted, 1.6 GPF siphon jet, model 3351.160.

B. Bowl: ASME A112.19.2; 10 inch by 12 inch water surface, vitreous china, with elongated rim, 1-1/2 inch top inlet spud, white bolt caps.

C. Flush Valve: ASSE 1037; Exposed, chrome plated brass, manual operation valve, concealed screwdriver stop and vacuum breaker; maximum 1.6 gallon flush volume. Sloan Royal, 110.

D. Seat: Solid white plastic, open front, extended back, self-sustaining hinge, corrosion resistant bolts, less cover. Church Model 295C.

E. Carrier: ASME A112.6.1; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.04 WATER CLOSET (WC-7)[FLOOR MTD, FLUSH VALVE, STD HEIGHT]

A. American Standard, floor mounted, Madera model 2234.001, elongated 1.6 GPF water closet.

B. Bowl: ASME A112.19.2M; siphon jet, vitreous china closet bowl, with elongated rim, 10 inch by 12 inch water surface, 1-1/2 inch inlet spud, white bolt caps.

C. Sensor Operated Flush Valve: ASSE 1037; High efficiency valve with hard wired solenoid operator, infrared sensor and over-ride button in chrome plated plate, screwdriver stop and vacuum breaker; maximum 1.6 gallon flush volume. Sloan Model 111-1.6 ES-S TMO.

D. Seat: Solid white plastic, open front, extended back, self-sustaining hinge, corrosion resistant bolts, less cover.

2.05 WATER CLOSET (WC-7A) [FLOOR MTD, FLUSH VALVE, ADA HEIGHT]

A. American Standard, floor mounted, Madera model 3043.001 elongated 1.6 GPF water closet, 17 inch high.

B. Bowl: ASME A112.19.2M; siphon jet, vitreous china closet bowl, with elongated rim, 10 inch by 12 inch water surface, 1-1/2 inch inlet spud, white bolt caps.

C. Sensor Operated Flush Valve: ASSE 1037; High efficiency valve with hard wired solenoid operator, infrared sensor and over-ride button in chrome plated plate, screwdriver stop and vacuum breaker; maximum 1.6 gallon flush volume. Sloan Model 111-1.6 ES-S TMO.

D. Seat: Solid white plastic, open front, extended back, self-sustaining hinge, corrosion resistant bolts, less cover.

E. Mount fixture and rough-ins at accessible height.

2.06 WATER CLOSET (WC-8) [FLOOR MTD, PRESSURE ASSIST TANK, STD HEIGHT]

A. American Standard, floor mounted, Cadet, elongated, pressure assist 1.6 GPF water closet model 2333.100.

B. Bowl: ASME A112.19.2; Floor mount, siphon jet, vitreous china with elongated rim, white bolt caps.

C. Tank: Pressure assisted Flushmate II system integral to tank. Left hand flush lever.

D. Seat: Solid white plastic, open front, extended back, self-sustaining hinge, corrosion resistant bolts, less cover.

2.07 WATER CLOSET (WC-8A)[FLOOR MTD, PRESSURE ASSIST TANK, ADA HEIGHT]

A. American Standard, floor mounted, Cadet Right Height, elongated, pressure assist 1.6 GPF water closet model 2377.100.

B. Bowl: ASME A112.19.2; Floor mount, siphon jet, vitreous china with elongated rim, 10 inch x 12 inch water surface area, white bolt caps.

C. Tank: Pressure assisted Flushmate II system integral to tank. Left hand flush lever.

D. Seat: Solid white plastic, open front, extended back, self-sustaining hinge, corrosion resistant bolts, less cover.

2.08 URINALS (UR-1 & UR-1A)

A. Urinal: ASME A112.19.2 vitreous china, wall hung, washout urinal with side shields, flushing rim, integral trap, 3/4 inch top spud, 0.5 gallon per flush design, hanger(s).
   1. American Standard Washbrook FloWise High Efficiency, model 6590.005.
   2. Kohler Bardon Superior, model K-4960-ET
   3. Sloan model SU-1005-0.5.
   4. Zurn EcoVantage model Z5758.205.

B. Flush Valve: ASSE 1037; Battery powered, infrared sensor operated valve for top spud washout urinal. Mechanical over-ride button, chrome plated brass construction, screw driver stop and vacuum breaker; 0.5 gallon per flush.
   1. American Standard Model 6063.051.002.
   2. Kohler Model K-10958.
   3. Sloan Optima model 8186-0.5.
   4. Toto model TEU1LN12#CP.

C. Wall Mounted Carrier: ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

D. Provide elastomeric gasket complying with ASME A112.4.3, or approved setting compound, for fixture to flange connection.

2.09 URINALS (UR-1 & UR-1A)

A. Urinal: ASME A112.19.2 vitreous china, wall hung, American Standard Allbrook FlowWise 0.5 model 6550.005 siphon jet urinal with flushing rim, integral trap, 3/4 inch top spud, 0.5 gallon per flush.

B. Flush Valve: ASSE 1037; Hard wired infrared sensor operated valve for top spud washout urinal. Mechanical over-ride button, chrome plated brass construction, screw driver stop and vacuum breaker; 0.5 gallon per flush. Sloan Optima model 186-0.5 ES-S TMO High Efficiency.

C. Wall Mounted Carrier: ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

D. Provide elastomeric gasket complying with ASME A112.4.3, or approved setting compound, for fixture to flange connection.

2.10 URINALS (UR-1 & UR-1A)

A. Urinal: ASME A112.19.2 vitreous china, wall hung, siphon jet urinal with side shields, flushing rim, integral trap, 3/4 inch top spud, 1.0 gallon per flush design.
   1. American Standard Trimbrook Model 6561.017.

B. Flush Valve: ASSE 1037; Exposed, chrome plated brass, manual operation valve, concealed screwdriver stop and vacuum breaker; maximum 1.0 gallon flush volume. Sloan Royal, 186-1.

C. Carrier: ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

D. Provide elastomeric gasket complying with ASME A112.4.3 for fixture to flange connection.

2.11 WALL HUNG LAVATORY (L- AND L- A)

A. Basin: ASME A112.19.2, American Standard Lucerne 0355.012, vitreous china, faucet holes 4 inches on center, 20x18 inch nominal with 15 inch by 10 inch by 6-1/2 inch deep bowl, 4 inch raised back, tapered side splash shields, drilled for concealed arm support, front overflow, self draining deck area.

B. Sensor Activated Faucet: ANSI A112.18.1M; American Standard Selectronic electronic proximity faucet, model 6056.105. Chrome plated, brass construction, metered mixing faucet with inlet strainer, 0.5 gpm aerator, wired solenoid, infrared sensor and transformer with [cord and plug power supply][hard wired power supply]. Provide all connections from power supply to sensors including cables, y-adapters, leaders, extension cable, etc. Provide model 605XTMV thermostatic mixing valve below lavatory. Additional faucets within 10 feet; use model 6057.10

C. Manual Faucet: ASME A112.18.1; Chicago Faucet Model 420 series. Chrome plated brass faucet with [7-1/4 inch][4-1/4 inch] single lever handle, ceramic cartridge [thermostatic ceramic cartridge, with 106 deg F maximum hot water temperature, model 420-X41KJKABNF, ASSE 1070] , aerator with maximum [0.5][1.5] gpm flow.

D. Mixing valve: American Standard Model 605XTMV thermostatic mixing valve mounted below sink. ASSE 1016 performance.

E. Accessories:
   1. Chrome plated 17 gage brass P-trap with clean-out plug and wall escutcheon.
   2. Open grid strainer with tailpiece.
   3. Flexible supplies.
   4. Trap and waste insulated and offset to meet ADA compliance for A suffix fixtures.

F. Floor Mounted Carrier: Josam 17100 Series, cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.12 WALL HUNG LAVATORY (L- AND L- A)

A. Basin: ASME A112.19.2, American Standard Lucerne 0356.041, vitreous china, single faucet hole, 20 inch by 18 inch nominal with 15 inch by 10 inch by 6-1/2 inch deep bowl, 4 inch raised back, tapered side splash shields, drilled for concealed arm support, front overflow, self-draining deck area.

B. Metering Faucet: ANSI A112.18.1; Chicago Faucets Model 807-E12-665PSHVPACP. Single inlet metering sink faucet, 2.2 GPM, Vandal proof aerator. 1-3/4 inch MVP metering push handle, adjustable cycle time closure cartridge.

C. Sensor Activated Faucet: ANSI A112.18.1M; American Standard Selectronic electronic proximity faucet, model 6056.105. Chrome plated, brass construction, metered mixing faucet with inlet strainer, 0.5 gpm aerator, wired solenoid, infrared sensor and transformer with [cord and plug power supply][hard wired power supply]. Provide all connections from power supply to sensors including cables, y-adapters, leaders, extension cable, etc. Provide model 605XTMV thermostatic mixing valve below lavatory. Additional faucets within 10 feet; use model 6057.10

D. Accessories:
   1. Chrome plated 17 gage brass P-trap with clean-out plug and wall escutcheon.

2. Open grid strainer.
3. Chrome plated brass stops and flexible supplies.
4. Supplies, stops, trap and offset tailpiece insulated to meet ADA compliance for A suffix fixtures.
5. ASSE 1070, water temperature limiting valve.

E. Carrier: Josam 17100 Series, cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.13 WALL HUNG STAINLESS STEEL LAVATORY (L-1)

A. Basin: ASME A112.19.2, Elkay ELV1817CS3, Type 304 stainless steel, faucet holes 2 inches on center, 18 inch by 17 inch nominal with 13 inch by 10 inch by 5-3/4 inch deep bowl, 5 inch raised back, stainless steel, angular support wall brackets, self-draining deck area.

B. Metered Faucet: ANSI A112.18.1M; Sloan model ETF-880-4-B-BDM electronic faucet, Chrome plated, brass construction, metal throat plate, metered mixing faucet with hard-wired (box mount) solenoid and infrared sensor, inlet strainer, 0.5 gpm vandal resistant aerator, below deck mechanical mixing valve, metal jacketed wire protection for sensor and solenoid leads.

C. Sensor Activated Faucet: ANSI A112.18.1M; American Standard Selectronic electronic proximity faucet, model 6056.105. Chrome plated, brass construction, metered mixing faucet with inlet strainer, 0.5 gpm aerator, wired solenoid, infrared sensor and transformer with [cord and plug power supply][hard wired power supply]. Provide all connections from power supply to sensors including cables, y-adapters, leaders, extension cable, etc. Provide model 605XTMV thermostatic mixing valve below lavatory. Additional faucets within 10 feet; use model 6057.105.

D. Accessories:
1. Chrome plated 17 gauge brass P-trap with clean-out plug and wall escutcheon.
2. Open grid strainer.
3. Chrome plated brass stops and flexible supplies.
4. Provide EL-248-40 transformer for each pair of electronic faucets.
5. ASSE 1070, water temperature limiting valve.

2.14 STAINLESS STEEL SINK (S-)

A. Elkay Model LR2522, single compartment sink.

B. Bowl: ASME A112.19.3; 25 inch by 22 inch outside dimensions, 18 gage, stainless steel. Self-rimming, 21 inch by 15-3/4 inch basin size, 8-1/8 inch deep. 3-5/8 inch drain hole, 3 hole ledge back drilled for trim.

C. Trim: ASME A112.18.1; Chicago Model 201-AGN8AE3-317CP. Chrome plated brass faucet with
8-inch chrome plated brass gooseneck swing spout, quarter turn, 4-inch wrist blade faucet handles, economy aerator with maximum 2.2 gpm flow.

D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, loose key stops, flexible supplies. Provide undercoating if not factory applied. SS strainer.

2.15 STAINLESS STEEL SINK (S-)

A. Elkay Model LR2219, single compartment sink.

B. Bowl: ASME A112.19.3; 22 x 19 inch outside dimensions, 18 gage, stainless steel. Self-rimming,
18 inch by 14 inch basin size, 7-5/8 inch deep. 3-5/8 inch drain hole, 3 hole ledge back drilled for trim.

C. Trim: ASME A112.18.1; Chicago Model 201-AGN2AE3-317CP. Chrome plated brass faucet with
5-1/4 inch chrome plated brass gooseneck swing spout, quarter turn, 4 inch wrist blade faucet handles, economy aerator with maximum 2.2 gpm flow.

D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, loose key stops, flexible supplies. Provide undercoating if not factory applied. SS strainer.

2.16 HOSPITALITY SINK (S-)

A. Kohler Stacatto K-3363-1, self-rimming, single compartment kitchen sink.

B. Bowl: ASME A112.19.3; 20 inch by 20 inch outside dimensions, 18 gage, stainless steel. Self-rimming, 16 by 13 by 8 inch basin size with 3-5/8 inch drain hole, ledge back drilled for trim.

C. Trim: ASME A112.18.1; Kohler Essex K-8761 chrome plated brass faucet with chrome plated brass gooseneck swing spout, quarter turn wrist blade faucet handles, economy aerator with maximum 2.2 gpm flow.

D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, loose key stops, flexible supplies. Provide undercoating if not factory applied.

2.17 HANDWASH SINK (S-)

A. Elkay Model CHSB1716C, wall mounted single compartment sink with 7 inch high backsplash.

B. Bowl: ASME A112.19.3; 22 x 19 inch outside dimensions, Type 304, 18 gage, stainless steel. Self-rimming, 16-3/4 by 15-1/2 basin size, 13 inch deep. 1-3/4 inch radius coved corners, 2-3/16 inch drain hole, 2 hole backsplash drilled for trim. Wall hanger support bracket.

C. Trim: ASME A112.18.1; Elkay Model LKB400. Chrome plated brass faucet with 3-1/2 inch chrome plated brass gooseneck swing spout, quarter turn, 2 inch lever faucet handles, aerator with maximum 2.2 gpm flow.

D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, loose key stops, flexible supplies. Provide undercoating if not factory applied. SS grid strainer.

2.18 HANDWASH SINK (S-)

A. Advance Tabco model 7-PS-68. NSF listed.

B. Bowl: 20 gage 304 stainless steel with integral backsplash. 10 inch by 14 inch by 5 inch deep, polished to a satin finish. 2-inch radius corners. 1-1/2 inch drain with basket strainer

C. Trim: Wrist blade handles on gooseneck faucet. Chrome plated tailpiece and P-trap.

D. Provide stop valves, supplies chrome escutcheon for wall penetration of water and waste pipes.

E. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, loose key stops, flexible supplies, chrome escutcheons for wall penetration of water and waste pipes.

2.19 THREE COMPARTMENT SINK (S-)

A. Sink: ANSI Standard A112.19.3. Advance Tabco Model T9-3-54-18, three 16 inch long by 20 inch wide (front-to-back) by 12 inch deep bowls, 3 inch rim, 16 gauge 304 stainless steel construction, one 18 inch long drainboard (refer to architectural drawings for drainboard side), full length 8-inch high backsplash, drilled for faucets. 3 inch radius corners, 3-1/2 inch drain holes, 8 holes, 4 inches on center. 1-5/8 inch diameter galvanized steel legs with 1 inch adjustable bullet feet. Provide undercoating if not factory applied.

B. Sink Faucet (drainboard side): Chicago Faucets Model 540-LDDJ13CP, 8 inch centers, back mount, DJ13 double-jointed swing spout, E3 2.2 GPM aerator, 369-PR Indexed Lever Handles, Quaturn™ Operating Cartridges, 1/2" NPSM Coupling Nut for 3/8 inch or 1/2 inch flexible riser.

C. Spray Faucet (pre-rinse): Chicago Faucets Model 510-GCLCP, 8 inch centers, back mount, hot and cold water faucet, #369 indexed handles, 23 inch riser with spring guide, 44 inch hose spray with 90L lever control insulated sprayer with wall hook, 1.0 GPM at 60 psi.

D. Provide rotary lever operated drain outlet for each compartment, Elkay Model LK25RT twist drain stopper with 2 inch tailpiece, 2 inch 17 gage chrome plated P-trap, wheel handle stops and flexible faucet supplies.

2.20 THREE COMPARTMENT SINK (S-4)

A. Advance Tabco DI-3-10, self-rimming, three compartment kitchen sink. Not NSF approved for permanent installations.

B. Bowl: Three 10-inch x 14-inch x 10-inch deep compartments, 20 gage, stainless steel, 2-inch radius corners. Self-rimming, 38-inch x 19-inch overall with 3-1/2 inch drain holes, ledge back drilled for trim.

C. Trim: ASME A112.18.1; Two Chicago Faucet model 895-317GN2ACP chrome plated brass faucets with 5-1/4-inch rigid/swing gooseneck, quarter turn wrist blade handles.

D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, loose key stops, flexible supplies. Chicago Faucet model 1366-NF lever handle twist drain with 1-1/2-inch IPS basket strainer for each outlet. Provide undercoating if not factory applied.

2.21 STAINLESS STEEL SINK (S-)

A. Double Bowl Undermount Sink. Elkay Model ELUHAD3118PD. 18 gage 304 stainless steel with two 13-1/2 inch by 16 inch by 4-1/2 inch deep bowls, polished to a satin finish. Provide template and counter mounting clips. 2-inch radius corners. 3-1/2 inch drain opening. 2 inch basket drain outlet, tailpiece and chrome plated P-trap. Drains located near rear to meet ADA accessibility.

B. Faucet: Chicago Faucets model 50-317CP, GN2A Rigid/Swing gooseneck spout, 4 inch wristblade handles, E3 2.2 GPM aerator, quarter turn compression cartridges.

C. Provide stop valves, supplies chrome escutcheon for wall penetration of water and waste pipes.

D. Provide insulation kit for supplies, stop valves and P-traps.

2.22 STAINLESS STEEL SINK (S-) [DECK MTD KITCHEN STYLE)

A. Double Bowl Self-rimming Sink. Elkay Model LRAD332155. 18 gage 304 stainless steel with two 13-1/2 inch by 16 inch by 5-1/2 inch deep bowls, polished to a satin finish. Provide template and counter mounting clips. 2-inch radius corners. 3-1/2 inch drain opening. 2 inch basket drain outlet, tailpiece and chrome plated P-trap. Drains located near rear to meet ADA accessibility

B. Faucet: Chicago Faucets model 1100-317ABCP, 8" swing spout, 4 inch wristblade handles, E3 2.2 GPM aerator, quarter turn compression cartridges.

2.23 MOP SINKS (S-)

A. Fiat model MSB2424, floor set mop service basin. 24 inch by 24 inch by 10 inch high, 1-piece molded stone construction with 1 inch wide shoulders, integral molded center drain outlet with dome strainer and lint basket, 3 inch outlet.

B. Faucet: Fiat model 830 AA, wall mounted, chrome plated brass construction with vacuum breaker, integral stops, adjustable wall brace, pail hook and 3/4 inch hose thread on spout cross or lever handles on 8 inch centers.

C. Accessories:
1. Hose: Provide 30 inch length of 3/4 inch rubber hose threaded to connect to faucet.
2. [check with arch if needed - Mop Bracket: 24 inch long, 3 inch high, stainless steel bracket with 3 rubber grips.]

2.24 LABORATORY SINKS (S-)

A. Sink, integral to countertop. See Division 12.

B. Faucet: Chicago Faucets Model 930-VR369ABCP, single hole, rigid gooseneck spout with vacuum breaker, lever handles, quarter turn compression cartridges.

C. Provide stop valves, supplies chrome escutcheon for wall penetration of water and waste pipes.

D. Acid Neutralizing Tank: Polyethylene ASTM D-1248, 1.5 gallon capacity, bolted lid, 3-inch cleanout, Orion Style 8 or approved equal. Provide with limestone chips.

E. Acid Waste: Provide acid resistant p-trap and drain to neutralizing tank. Polyethylene pipe, fittings, and manufacturer's no-hub couplers. By Orion, or approved equal.

F. Add Acid Pipe spec to 23 05 00 or 23 13 00

2.25 LAUNDRY TRAY (S-3)

A. Fixture: ANSI Z124.6, cast polymer, nominal size 22 inches by 17 inches basin, 13" deep, white, freestanding on manufacturer's metal legs.

B. Faucet: deck mounted, 6-3/4" spout, vacuum breaker with hose thread.

C. Basis of Design: Fiat Model SF-1

D. Accessories:
1. Chrome plated 17 gauge brass P-trap with clean-out plug and wall escutcheon.
2. Flexible supplies.

2.26

2.27 SHOWERS (SH-)

A. Trim and Valve Assembly and Accessories: ASME A112.18.1.
1. Showerhead: Kohler Forte K-10240 showerhead, with 1.75 gpm flow control.
2. Valve Trim: Kohler Forte Rite-Temp K-T10277-4A valve trim.
3. Shower Valve: Kohler Rite-Temp K-305 with pressure balanced thermostatic mixing valves, integral service stops, integral diverter mechanism, and high-temperature limit.

2.28 SHOWERS (SH- A,)[ADA W/ FIXED HEAD & HAND SHOWER]

A. Trim and Valve Assembly and Accessories: ASME A112.18.1.
1. ADA Compliant.
2. Shower Valve with Diverter: Delta T13H382 pressure balanced mixing valve with 3.3 inch chrome plated metal handle, integral checks, screwdriver stops, temperature limit stop and R10700-UNWS chrome plated brass diverting valve.
3. Showerhead: Delta H2OKinetic Technology 1.6 gpm flow, with arm and wall flange.
4. Slide Bar Kit: 1.5 gpm VB (ASSE) handshower with double check backflow prevention, white plastic with 70 inch white vinyl flexible hose, wall elbow and 24 inch stainless steel slide bar.
5. Hand Shower Hose and Holder: 1.5 gpm VB (ASSE) handshower with double check backflow prevention, white plastic with 70 inch white vinyl flexible hose, wall elbow and 2 wall hooks.

2.29 SHOWERS (SH- A,)[ADA W/ HAND SHOWER ONLY]

A. Enclosure: See Architectural drawings.

B. Trim and Valve Assembly and Accessories: ASME A112.18.1.
1. ADA Compliant.
2. Model: Chicago Faucet SH-TP1-00-023
3. Shower Valve: Chicago Faucet 1920-XJKNF pressure and temperature balanced mixing valve with 3.3 inch chrome plated metal handle, integral checks, screwdriver stops, temperature limit stop.

4. Slide Bar Kit: 24 inch stainless steel slide bar.
5. Hand Shower Hose and Holder: 2.5 gpm handspray with 69 inch stainless steel hose, in-line vacuum breaker, and pause control.

2.30 SHOWERS (SH- A)

A. Trim and Valve Assembly and Accessories: ASME A112.18.1.
   1. Showerhead: Kohler Stillness Purist multifunction handshower Model K-973-CP. Chrome plated plastic with spray adjuster. 2.5 gpm flow control.
   2. Shower Valve: Kohler Rite Temp K-304-KS pressure balancing valve with screwdriver stops.
   3. Valve Trim: Kohler MasterShower model K-T9492-4-CP.
   4. Slide Bar Kit: Kohler Mastershower K-8516 with integral soap dish and 60-inch metal hose with swivel end. Match showerhead finish.
   5. Hand Shower Hose and Holder: Kohler K-9514 MasterShower 60-inch metal hose and Kohler Stillness K-975 hand shower holder. Match showerhead finish.

2.31 SHOWERS (SH-)

A. Trim and Valve Assembly and Accessories: ASME A112.18.1.
   1. Chicago Faucets Model 770-665PSHCP, on-off flow controller with slow closing valve.
   2. Showerhead: Delta 30 degree vandal resistant, cast, wall mount showerhead; 1.5 gpm.

2.32 SHOWERS (SH- A)

A. Trim and Valve Assembly and Accessories: ASME A112.18.1.
   1. ADA Compliant.
   2. Chicago Faucets Model 770-665PSHCP, on-off flow controller with slow closing valve.
   3. Diverter: Divert flow from handheld shower to fixed wall mount showerhead.
   4. Showerhead: Delta 30 degree vandal resistant, cast, wall mount showerhead; 1.5 gpm.
   5. Hand Shower Hose and Holder: 1.5 gpm VB (ASSE) handshower with double check backflow prevention, white plastic with 70 inch white vinyl flexible hose, wall elbow and two wall hooks.

2.33 SHOWERS (SH- A)[WALL PACK WITH METERING BUTTON]

A. Enclosure: See Architectural drawings.

B. NSF Standard: Comply with NSF 61, "Drinking Water System Components – Health Effects," for shower materials that will be in contact with potable water.

C. Wall Cover:
   1. Type 304 stainless steel, 0.050 inch thick (minimum)
   2. Removable with vandal resistant screws
   3. Integral soap dish.

D. Faucet:
   1. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
   2. Body Material: Solid brass.
   3. Finish: Polished chrome plate.
   4. Maximum Flow Rate: 2.5 gpm unless otherwise indicated.
   5. Mounting: Concealed.

6. Operation: Electronically metered push button control. 60-second operation per push. Hard wired transformer. Provide all connections from power supply to sensors including cables, y-adapters, leaders, extension cable, etc.. Basis of Design: Bradley "Touchtime"

E. Shower Head:
   1. Standard: ASME A112.18.1/CSA B125.1.
   2. Type: Ball joint with arm and flange.
   3. Shower Head Material: Metallic with chrome-plated finish.
   4. Spray Pattern: Fixed.

F. Basis of Design: Bradley HN200.

2.34 SHOWERS (SH-1A) [ACCESSABLE WALL PACK, FLUSH MOUNT, WITH METERING BUTTON]

A. Enclosure: See Architectural drawings.

B. NSF Standard: Comply with NSF 61, "Drinking Water System Components – Health Effects," for shower materials that will be in contact with potable water.

C. Wall Cover:
   1. Type 304 stainless steel, 0.050 inch thick (minimum)
   2. Removable with vandal resistant screws
   3. Integral soap dish.

D. Faucet:
   1. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
   2. Body Material: Solid brass.
   3. Finish: Polished chrome plate.
   4. Maximum Flow Rate: 2.5 gpm unless otherwise indicated.
   5. Mounting: Concealed.
   6. Operation: Electronically metered push button control. 60-second operation per push. Hard wired transformer. Provide all connections from power supply to sensors including cables, y-adapters, leaders, extension cable, etc.. Basis of Design: Bradley "Touchtime"

E. Shower Head Assembly (Accessible):
   1. Standard: ASME A112.18.1M/CSA B125.1.
   2. Type: Hand-held shower head with on-off control.
   3. Diverter valve: Lever handle for transfer of water between fixed showerhead and hand-held spray.
   4. Shower Head Material: Metallic with chrome-plated finish.
   5. Hose: 60 inch chrome plated flexible metallic hose.

F. Shower Head:
   1. Standard: ASME A112.18.1/CSA B125.1.
   2. Type: Ball joint with arm and flange.
   3. Shower Head Material: Metallic with chrome-plated finish.
   4. Spray Pattern: Fixed.

G. Basis of Design: Bradley WS-1.

2.35 DRINKLING FOUNTAIN (DF-)

A. Elkay LMABFDL Single height, wall mounted non-refrigerated, filtered drinking fountain.

B. Fountain:
   1. Wall mount with stainless steel top, painted steel body, anti-squirt bubbler with flexible stream guard, automatic stream regulator, integral WaterSentry VII Filter System, push button operation, mounting bracket.

2.36 DRINKING FOUNTAIN (DF- AND DF- A)

A. Elkay EHWM214C heavy duty, wall mount, barrier free drinking fountain.

B. Construction:
   1. 14 gage type 304 stainless steel construction, satin finish, vandal resistant anti-squirt bubbler.
   2. Vandal resistant push button operation. Automatic stream regulator, P-trap included.
   3. Provide stainless steel wall plate and vandal resistant 14 gage bottom cover.
   4. Furnish mounting bracket and ML100 in-wall support legs and mounting hardware.

C. Mounting: Provide fixtures for dual height compliance with ADA.

2.37 ELECTRIC WATER COOLERS WITH FILTER AND BOTTLE FILLER (EWC- A)

A. Elkay LZSTL8WSLK Dual height, wall mounted electric water cooler with bottle filler.

B. Fountain:
   1. ARI 1010; self-contained, wall hung, electric refrigerated water cooler with stainless steel top, painted steel body, 3000 gallon water filter, elevated anti-squirt bubbler with flexible stream guard, automatic stream regulator, push button operation, mounting bracket, integral air cooled condenser and grille. 8.0 GPH of 50 degree F water at 90 degree F ambient conditions and 80 degree F inlet water temperature.
   2. Provide accessory water bottle filler on higher elevation basin.

C. Bottle Filler: 1.1 gpm flow rate, laminar flow, automatic 20 second shut-off.

2.38 ELECTRIC WATER COOLERS (EWC-)

A. Elkay VRCHDTL8SC wall mount, dual water cooler.

B. Fountain:
   1. ARI 1010; self-contained, wall hung, electric refrigerated water cooler with stainless steel top, stainless steel body, elevated anti-squirt bubbler with vandal resistant stream guard, automatic stream regulator, push button, mounting bracket, integral air cooled condenser and grille.

2.39 LAVATORY INSULATION KIT

A. Acceptable Manufacturers:
   1. Handi Lav Guard.
   2. Truebro.

B. Product Description: Where Lavatories are noted to be insulated for ADA compliance, furnish the following: Safety Covers conforming to ANSI A117.1 and consisting of insulation kit of molded closed cell vinyl construction, 3/16 inch thick, white color, for insulating tailpiece, P-trap, valves, and supply piping. Furnish with weep hole and angle valve access covers.

2.40 APPLIANCE OUTLET BOX (OB-1)

A. Acceptable Manufacturers:
   1. Oatey.
   2. Guy Grey.
   3. Approved equal

B. Product Description: Recessed galvanized metal box and faceplate, with white enamel finish. Lead free quarter turn valve, water hammer arrestor

2.41 CLOTHES WASHER CONNECTION BOX (WB-1)

A. Acceptable Manufacturers:
   1. Oatey.
   2. Guy Grey.
   3. Approved equal

B. Product Description: Recessed galvanized metal box and faceplate, with white enamel finish, water hammer arrestors, hot and cold water valves with single lever handle, hose thread connections, two-inch waste connection.

2.42 EMERGENCY EYEWASH (EW-1)

A. Acceptable Manufacturers:
   1. Acorn model S0430-PT1.
   2. Speakman
   3. Bradley Corp.
   4. Encon Safety Products model 01045001.
   5. Haws Co.
   6. Update to backflow compliant bowl

B. Fixture:
   1. Eyewash: ANSI Z358.1,
   2. Stainless steel receptor bowl with dual spray heads with flip top dust caps,
   3. 1-1/4 inch galvanized steel frame, tailpiece and P-trap.
   4. 2.4 GPM nominal flow rate.
   5. Corrosion resistant push handle attached to 1/2-inch full port stay open ball valve.
   6. Universal emergency sign.

2.43 EMERGENCY EYE-FACE WASH (EFW-1)[WALL MOUNTED]

A. Acceptable Manufacturers:
   1. Acorn model S0440-PT1.
   2. Speakman
   3. Bradley Corp. model S19224TPT

4. Encon Safety Products model
5. Haws Co. model 7360BT-7460BT
6. Update to backflow compliant bowl

B. Fixture:
   1. Eye/Face Wash:
      a. ANSI Z358.1, Wall mounted, stainless steel receptor bowl with multiple spray heads.
      b. Automatic operation flip open dust caps, corrosion resistant construction.
      c. Push handle attached to 1/2-inch full port stay open ball valve. 5.1 GPM flow rate.
      d. 1-1/2˝ or 1-1/4 inch chrome plated brass or stainless steel drain, tailpiece and P-trap.
      e. Universal emergency sign.

2.44 EMERGENCY EYE/FACE WASH (EEW-1)[DECK MOUNTED SWING DOWN]

A. Acceptable Manufacturers:
   1. Bradley
   2. Speakmant
   3. Encon Safety Products
   4. Haws

B. Fixture:
   1. Deck mounted, eye/facewash: ANSI Z358.1, Provide factory-assembled and tested units with standard-compliant identification sign and inspection tag.
   2. Eyewash: 5.1 gpm (0.321 L/s) impact resistant ABS plastic sprayhead.
   3. Ball Valve: NPT 1/2-inch, chrome-plated brass stay-open wash valve.
   4. Valve Operation: swing down arm.
   5. Tempering valve: Refer to Section 22 11 00.
   6. Basis of Design Manufacturer/Model: Bradley, Deck-Mount Halo Eyewash S19274JD Series.

2.45 SELF-CONTAINED EMERGENCY EYEWASH (EEW-1)

A. Acceptable Manufacturers:
   1. Bradley.
   2. Encon Safety Products.
   3. Haws.
   4. Honeywell.
   5. Speakman Company.

B. Fixture:
   1. Self-contained eyewash unit: ANSI Z358.1, wall mounted.
   2. Capacity: Not less than 0.4 gpm for at least 15 minutes.
   3. Gravity Tank: factory sealed cartridges.
      a. Flushing Fluid: Medically Potable water preserved with water additive.
   4. Heated Blanket: For freeze protection.
   5. Actuator: Pull-down front panel.
   6. Spray Heads: Protected, two mounted on tank.
   7. Alarms: built in alarm sounds when unit has been activated and when 15-minute flush completed.
   8. Universal emergency sign.
   9. Basis of Design: Honeywell Fendall 2000

2.46 EMERGENCY EYEWASH AND SHOWER (ESH-1)

A. Acceptable Manufacturers:
   1. Speakman, model SE 695.
   2. Bradley Corp. model S19-310TT.
   3. Encon Safety Products, model 01050251.
   4. Haws Co., model 8320-8325.
   5. Update to backflow compliant bowl

B. Fixture:
   1. Drench Shower: ANSI Z358.1, floor mount with base drilled for anchoring, 1-1/4 inch IPS galvanized steel stanchion, 8 inch minimum diameter, 20-gpm plastic or stainless steel shower head, 1-inch stay open valve actuated by aluminum or stainless steel pull rod.
   2. Eyewash: ANSI Z358.1, plastic or stainless steel receptor bowl with dual spray heads with flip top dust caps, 1-1/4 inch galvanized steel frame and drain pipe. Corrosion resistant push handle attached to 1/2" full port stay open ball valve.
   3. Universal emergency sign.

2.47 EMERGENCY EYEWASH WITH DRENCH HOSE (EEW-2)

A. Acceptable Manufacturers:
   1. Acorn
   2. Guardian
   3. Speakman model SE-490 (does not meet ARRA buy American requirements)
   4. Bradley Corp.
   5. Encon Safety Products model 01045001.
   6. Haws Co.

B. Fixture:
   1. Dual purpose eyewash/drench hose: ANSI Z358.1,
   2. Spray Head: flip top dust covers, internal flow control, 2.4 GPM nominal flow rate.
   3. Hose: reinforced nylon, 180 psi maximum working pressure, 12 foot long, coiled self-retracting
   4. Valve: Corrosion resistant push handle attached to 1/2-inch full port stay open ball valve.
   5. Mounting: bracket with spring clips
   6. Backflow Preventer: in-line dual check on hose inlet
   7. Sign: ANSI compliant identification sign
   8. Basis of Design: Guardian G5014BP

C.

2.48 ACID NEUTRALIZATION TANK

A. Acid Neutralizing Tank: Polyethylene ASTM D-1248, 1.5 gallon capacity, bolted lid, 3-inch cleanout. Provide with limestone chips. Basis of Design: Orion Style 8 or approved equal.

B. Acid Waste/Vent: Provide acid resistant p-trap, drain, and independent vent to neutralizing tank. Polyethylene pipe, fittings, and manufacturer's no-hub couplers. Basis of design: Orion, or approved equal.

2.49 HOSE BIBBS AND HYDRANTS

A. Refer to Section 22 11 00 Facility Water Distribution.

2.50 HOSE REEL

A. Manufacturers:
   1. Beckerarena Products.
   2. Reelcraft.

B. Description:
   1. Standard hose reel for 250 feet of 1 inch I.D. hose. Hand crank, water tight bearing assembly and bracket suitable for base mounting.
   2. Accessories:
      a. Hose: 250 feet 1 inch ID red hose.
      b. Hose end fittings.
      c. Red flooding nozzle.

2.51 ICE RESURFACER FILLING STATION (PROVIDE 2 THUS)

A. Manufacturers:
   1. Becker Arena Products, Inc.
   2. OPW.

B. Description:
   1. 20 foot length of 1-inch red hose with shut-off valve at rigid piping connection.
   2. Provide OPW model 102 Spring Balance Hose Retractor. Connect at midpoint of hose.
   3. Provide OPW model 7H-5900 fill nozzle with aluminum body, dash-pot action, low flow shut-off, yellow plastic coated body and handle. Connect at end of hose.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00: Coordination and project conditions.

B. Verify walls and floor finishes are prepared and ready for installation of fixtures.

C. Verify electric power is available and of correct characteristics.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

B. Install fixture and rough-ins with A suffix at accessible height.

3.03 INSTALLATION

A. Install Work in accordance with Minnesota Plumbing Code.

B. Install each fixture with trap, easily removable for servicing and cleaning.

C. Provide 17 gauge, chrome plated brass adjustable p-trap with cleanout on fixtures reducing traps. Traps for mop sinks shall be cast iron.

D. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

E. Provide water temperature limiting valve on lavatories. Set temperature to 110 deg. F.

F. Install components level and plumb.

G. Install and secure fixtures in place with wall supports, wall carriers, and bolts.

H. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 00, color to match fixture.

I. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

J. For ADA accessible water closets, install flush valve with handle to wide side of stall.

K. Refer to Architectural Drawings for fixture locations and mounting heights.

L. Emergency fixtures: Extend discharge piping to floor and terminate with elbow discharging towards nearest floor drain.

3.04 ADJUSTING

A. Section 01 70 00: Testing, adjusting, and balancing.

B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.05 CLEANING

A. Section 01 70 00: Final cleaning.

B. Clean plumbing fixtures and equipment.

3.06 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00: Protecting installed construction.

B. Do not permit use of fixtures before final acceptance.

END OF SECTION

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SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Administrative requirements for HVAC systems:
      a. Submittals.
      b. Quality Assurance.
      c. Delivery, storage and handling.
   2. Pipe and pipe fittings:
      a. Equipment drains.
   3. General duty valves.
   4. Pipe hangers and supports.
      a. Hanger rods.
      b. Inserts.
      c. Flashing.
      d. Sleeves.
      e. Formed steel channel.
      f. Equipment bases and supports.
   5. Firestopping relating to HVAC work.
      a. Firestopping accessories.
   6. Pipe and equipment identification.
      a. Tags.
      b. Pipe markers.

B. Related Sections:
   1. Section 01 07 00 - Product warranties and product bonds.
   2. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
   3. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
   4. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this section.
   5. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
   6. Section 07 90 00 - Joint Protection: Product requirements for sealant materials for placement by this section.
   7. Section 09 91 00 - Painting and Coating: Product and execution requirements for painting specified by this section.
   8. Section 22 05 00 Common Work results for Plumbing: Administrative, and procedural requirements for plumbing piping, fixtures and equipment.
   9. Section 23 07 00 - HVAC Insulation: Insulation requirements related to sizing pipe hangers to encompass insulation.

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):
   1. A13.1 - Scheme for the Identification of Piping Systems.
   2. B16.3 - Malleable Iron Threaded Fittings.

3. B16.4 - Gray Iron Threaded Fittings.
4. B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
5. B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
6. B31.9 - Building Services Piping.

B. ASTM International (ASTM):
1. A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
3. A536 - Standard Specification for Ductile Iron Castings.
4. B88 - Standard Specification for Seamless Copper Water Tube.
5. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
6. E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
7. E814 - Standard Test Method for Fire Tests of Through Penetration Fire Stops.
8. E1966 - Standard Test Method for Fire-Resistive Joint Systems.
9. F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

C. American Welding Society (AWS):
1. A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
2. D1.1 - Structural Welding Code - Steel.

D. International Association of Plumbing and Mechanical Officials (IAPMO):
1. PS 117 - Copper, Copper Alloy, Carbon Steel, and Stainless Steel Piping Systems with Press-Type or Nail-Type Connections

E. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:
1. SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. SP 69 - Pipe Hangers and Supports - Selection and Application.
3. SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

F. Underwriters Laboratories Inc. (UL):
1. 263 - Fire Tests of Building Construction and Materials.
2. 723 - Tests for Surface Burning Characteristics of Building Materials.
3. 1479 - Fire Tests of Through-Penetration Firestops.
4. 2079 - Tests for Fire Resistance of Building Joint Systems.
5. Fire Resistance Directory.

1.03 SUBMITTALS

A. Section 01 33 00: Submittal procedures.

B. Product Data:
1. Identify specific products to be used on the project.
2. Submit data on pipe materials and fittings including project application.
3. Submit data on general duty valves.
4. Catalog data for equipment labels, valve tags and pipe identification.

C. Closeout Submittals:
1. Submit copies of inspector acceptance of gas piping and mechanical work.
2. Submit Operation and Maintenance manuals in accordance with closeout procedures.

D. Project Record Documents:
   1. Record actual locations of tagged valves; include valve tag numbers.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.9 code for installation of piping systems.

B. Use joint grooving tools and materials provided from a single manufacturer.

C. Furnish date stamped castings for couplings, fittings and valve bodies.

D. Perform Work in accordance with Minnesota State Building Code.

E. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

1.05 QUALIFICATIONS

A. Explanation of manufacturer listings for Part 2 of Division 23 Sections:
   1. Select equipment from the listed manufacturers where a list of manufacturers are listed under the heading "Manufacturers."
      a. Manufacturers not listed must submit for and be granted approval prior to the end of the bidding period for use on this Project.
      b. The list of manufacturers is provided as a convenience to the Contractor, indicating manufacturers that may be able to meet the indicated requirements.
      c. Being listed does not indicate the availability of any product or approval of a product not containing the indicated features.
   2. Use products meeting the indicated requirements where a list of manufacturers are listed under the heading "Acceptable Manufacturers."
      a. Approval to use products from manufacturers not listed is not a requirement.
      b. The list of manufacturers is provided as a convenience to the Contractor, indicating manufacturers that may be able to meet the indicated requirements.
      c. Being listed does not indicate the availability of any product or approval of a product not containing the indicated features.
   3. Use products meeting the indicated requirements where manufacturers are not listed for products.
      a. Approval to use products from manufacturers not listed is not a requirement.

B. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years experience.

C. Installer: Company specializing in performing work of this Section with minimum 3 years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00: Requirements for transporting, handling, storing, and protecting products.

B. Furnish temporary end caps and closures on pipes.

C. Provide temporary caps on fittings and valves removed from shipping containers and not immediately installed.

D. Protect piping from entry of foreign materials using temporary covers for idle sections of the Work.

1.07 WARRANTY

A. Refer to Section 01 07 00.

B. Warranty 12 months from date of substantial completion, unless longer warranty is specified for individual appliance, equipment, or material.

PART 2 PRODUCTS

2.01 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.
   1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
   2. Joints: Threaded for pipe 2 inch and smaller.

B. Copper Tubing: ASTM B88, Type M, hard temper.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder.

C. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26, polyvinyl chloride (PVC) material.
   1. Fittings: ASTM D2466, Schedule 40, PVC.
   2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.02 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
   1. Ferrous Piping: Class 150, malleable iron, threaded.
   2. Copper Piping: Class 150, bronze unions with soldered ends.

B. Flanges for pipe 2-1/2inches and larger:
   1. Ferrous piping: Class 250 forged steel slip-on flanges.
   2. Copper piping: Class 150 slip-on bronze flanges.
   3. Gaskets: 1/16 inch thick preformed neoprene gaskets.
   4. Grooved mechanical couplings for grooved piping systems.

2.03 PIPE HANGERS AND SUPPORTS

A. Acceptable Manufacturers:
   1. Anvil (Grinnell).
   2. B-Line - Coopers.
   3. Carpenter & Paterson Inc.
   4. Erico - Caddy System.
   5. PHD Manufacturing.

B. Heating Water and Core Water Systems:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.

4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
9. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 inches and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast-iron roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Copper-plated, Carbon-steel ring.

2.04 DUCT HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.05 HANGER ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.06 INSERTS

A. Acceptable Manufacturers:
   1. Cooper B-Line.
   2. Hilti.
   3. Simpson Strong Tie Company.
   4. Unistrut Corp.

B. Inserts: Galvanized steel shell and expander plug with threaded connection and lateral adjustment. Top slot for reinforcing rods, lugs for attaching to forms. Size inserts to suit threaded hanger rod loading.

2.07 FLASHING

A. Metal Flashing: 26-gauge thick galvanized steel.

B. Metal Counterflashing: 22-gauge thick galvanized steel.

C. Lead Flashing:
   1. Waterproofing: 5 lb./sq. ft sheet lead.
   2. Soundproofing: 1 lb./sq. ft sheet lead.

D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

2.08 SLEEVES

A. Sleeves for pipes and ducts through non-fire rated floors: Schedule 10 steel pipe or 18-gauge galvanized steel sheet metal.

B. Sleeves for pipes or ducts through non-fire rated beams and masonry walls: Schedule 10 steel pipe or 18-gauge galvanized steel sheet metal.

C. Sleaves for pipes through non-fire rated gypsum wall board: 24 gage galvanized sheet metal.

2.09 MECHANICAL SLEEVE SEALS

A. Acceptable Manufacturers:
   1. Thunderline Link-Seal, Inc.
   2. NMP Corporation.

B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.10 FORMED STEEL CHANNEL

A. Acceptable Manufacturers:
   1. Elcen.
   2. B-Line Systems.
   3. Hilti.
   4. Powerstrut, Inc.
   5. Unistrut Corp.
   6. Fee and Mason.

B. Product Description: Galvanized 12 gauge thick steel. With holes 1-1/2 inches on center.

2.11 FIRESTOPPING

A. Acceptable Manufacturers:
   1. Dow Corning Corp.
   2. Fire Trak Corp.
   3. Hilti Corp.
   4. International Protective Coating Corp.
   5. 3M fire Protection Products.
   6. Specified Technology, Inc.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only 1 type for each similar application:
   1. Silicone Firestopping Elastomeric Firestopping: Multiple component silicone elastomeric compound and compatible silicone sealant.
   2. Foam Firestopping Compounds: Multiple component foam compound.
   3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
   4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
   5. Mechanical Firestopping Device With Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
   6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
   7. Firestop Pillows: Formed mineral fiber pillows.

2.12 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:
   1. Mineral fiberboard.
   2. Mineral fiber matting.
   3. Sheet metal.
   4. Plywood or particle board.
   5. Alumina silicate fire board.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

D. General:
   1. Furnish UL listed products or products tested by independent testing laboratory.
   2. Select products with rating not less than rating of wall or floor being penetrated.

E. Non-Rated Surfaces:
   1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
   2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

2.13 VALVE TAGS

A. Plastic Tags:
   1. Acceptable Manufacturers:
      a. W.H. Brady.
      b. Marketing Systems, Inc.
      c. MSI.
      d. Seton Identification Products.
   2. Laminated 3-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter.

B. Metal Tags:
   1. Acceptable Manufacturers:
      a. W.H. Brady.
      b. Marketing Systems, Inc.
      c. MSI.
      d. Seton Identification Products.
   2. Aluminum with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges.

2.14 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Plastic Pipe Markers:
   1. Acceptable Manufacturers:
      a. W.H. Brady.
      b. Marketing Systems, Inc.
      c. MSI.
      d. Seton Identification Products.
   2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers:
   1. Acceptable Manufacturers:
      a. W.H. Brady.
      b. Marketing Systems, Inc.
      c. MSI.
      d. Seton Identification Products.

2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Plastic Underground Pipe Markers:
1. Acceptable Manufacturers:
   a. W.H. Brady.
   b. Marketing Systems, Inc.
   c. MSI.
   d. Seton Identification Products.
2. Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.
3. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Natural Gas Service" in large letters.

2.15 LABELS

A. Acceptable Manufacturers:
1. W.H. Brady.
2. Champion.
3. MSI.
4. Ready Made.
5. Seton Identification Products.

B. Description: Laminated 3-layer rigid plastic with engraved black letters on light colored background. 1.9 inch by 0.75 inch minimum size, adhesive backed. Comply with ASME A13.1 standard for colors and locations.

C. Control Device Labels: Pressure sensitive machine printed labels, black print on white field.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00: Acceptance of existing conditions.

B. Verify excavations are to required grade, dry, and not over-excavated.

C. Verify trenches are ready to receive piping.

D. The contractor is responsible for verifying invert elevations with respect to building finished floor elevations and site provisions.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end pipe for welding.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges, grooved joint couplings, or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

E. Select hangers to surround insulation, shield and piping on insulated pipe.

F. Review equipment installation and operation manuals prior to installing equipment.

3.03 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above flush with top of slab.

3.04 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Install in accordance with ASME 31.9.

B. Support horizontal piping as scheduled.

C. Install hangers with minimum 1/2-inch space between finished covering and adjacent work.

D. Place hangers within 12 inches of each horizontal elbow.

E. Use hangers with 1-1/2 inch minimum vertical adjustment.

F. Support vertical piping at every floor.

G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping or sheet lead packing between hanger or support and piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Provide clearance in hangers and from structure and other equipment for installation of insulation.

3.05 INSTALLATION – DUCT HANGERS AND SUPPORTS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
   5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.06 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members, formed steel channel, or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.07 INSTALLATION - SLEEVES

A. Exterior Watertight Entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through floors 1 inch above finished floor level; 2 inches for potentially wet floors. Caulk sleeves.

E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing or firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install chrome plated steel escutcheons at finished surfaces.

3.08 INSTALLATION - FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, and other items, requiring firestopping.

B. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, and other items requiring firestopping.

3.09 INSTALLATION - PIPING

A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

C. Group piping whenever practical at common elevations.

D. Sleeve pipe passing through partitions, walls and floors.

E. Slope piping and arrange systems to drain at low points.

F. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

G. Install piping penetrating roofed areas to maintain integrity of roof assembly.

H. Install piping specialties in accordance with Section 23 21 16.

I. Provide sleeves for piping through footings, foundation walls and floors.

J. Provide shut-off valves:
   1. As required by Code.
   2. At branch lines serving more than one terminal device.
   3. With extended valve stems for insulated piping applications.
   4. With screwed connections for piping 2-1/2 inch and smaller.
   5. With flanged connections for piping 3 inch and larger.
   6. With hose end caps on low point drains.

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. Install unions downstream of valves and at equipment or apparatus connections.

M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

N. Install grooved joints in accordance with the manufacturer's latest published installation instructions.
   1. Clean joint surfaces, rejecting defects such as indentations, projections, and roll marks in the area from pipe end to groove.
   2. Use elastomer grade gaskets suitable for the intended service, molded and produced by the coupling manufacturer.

O. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.

3.10 INSTALLATION - VALVES

A. Install valves with stems upright or horizontal, not inverted.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install 3/4-inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

D. Install valves with clearance for installation of insulation and allowing access.

E. Locate valve to be accessible through access panels where valves are installed above gypsum or plaster ceilings and chases. Coordinate size and location of access doors.

F. Refer to Section 22 07 00 for insulation requirements for valves.

G. Applications:
   1. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
   2. Install shutoff and drain valves at locations indicated on Drawings and/or specified herein.

3.11 INSTALLATION - HVAC EQUIPMENT

A. Follow manufacturer's published installation instructions.

3.12 HANGER SCHEDULE

A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE MAXIMUM HANGER SPACING Feet	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	3/8	7	3/8
3/4	5	3/8	7	3/8
1	6	3/8	7	3/8
1-1/4	7	3/8	7	3/8
1-1/2	8	3/8	9	3/8

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE MAXIMUM HANGER SPACING Feet	STEEL PIPE HANGER ROD DIAMETER Inches
2	8	3/8	10	3/8
2-1/2	9	1/2	11	1/2
3	10	1/2	12	1/2
4	12	1/2	14	5/8
5	13	1/2	16	5/8
6	14	5/8	17	3/4
8	16	3/4	19	3/4

B. Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

3.13 FIRESTOPPING SCHEDULE

A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10-inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings not less than 1 hour:
   1. Wall Penetrations: Fire F-Ratings not less than 1 hour.
   2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings not less than 1 hour:
      a. Floor Penetrations Within Wall Cavities: T-Rating is not required.

B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion:
   1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of 3 stories.
   2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of 2 stories.

C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve one hour fire resistant rating for assembly in which joint is installed.

D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10-inch water gage minimum positive pressure differential to achieve one hour fire resistant rating for floor assembly.

E. Surface Burning Characteristics: Maximum 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.

3.14 VALVE IDENTIFICATION

A. Provide a typewritten list identifying numbered valves. Identification shall include valve number, service, location and area served.

B. Three copies shall be incorporated in maintenance manuals.

C. Post one framed copy under acrylic glazing in the mechanical room or other owner designated location.

3.15 PIPE IDENTIFICATION

A. Refer to Section 22 05 00 for additional pipe identification requirements.

B. Use pressure sensitive labels, pre-formed markers or stenciling.

C. Include labeling of service, direction of flow and tape bands at each end of labels with approved colors.

D. Stencils: Black letters on a yellow background using stenciling brushes. Provide stencils for pipe service and direction of flow 1 inch minimum height.

E. Provide pipe identification for exposed piping within the building and in accessible concealed spaces, such as above lay-in ceilings and at access panels. Minimum locations:
   1. At not more than 30 foot intervals on straight runs of pipes.
   2. Wherever a pipe turns 90 degrees.
   3. Wherever a pipe passes through a wall, on both sides.
   4. At other locations deemed necessary for ease of maintenance, e.g. access panels.

F. Piping that does not require identification:
   1. Below grade piping.
   2. Inaccessible piping concealed in chase walls.

G. Abbreviations: label the piping as follows:
   1. Condensate Drain or CD
   2. Heating Water Supply or HWS
   3. Heating Water Return or HWR
   4. Condenser Supply Water or COND S
   5. Condenser Return Water or COND R
   6. Natural Gas or GAS
   7. Refrigeration Liquid or REF. LIQ.
   8. Refrigeration Suction or REF. SUC.

3.16 EQUIPMENT IDENTIFICATION

A. Provide identification labels for scheduled equipment permanently affixed to equipment with mechanical fasteners (rivets, screws, bolts or other approved methods) in a prominent location.

B. Install labels level and drawn tight to the equipment surface. Provide backing or back-up plates where required by the fastening devices. On pumps and similar small equipment, the label may be located on the wall adjacent to the equipment.

C. Equipment labeling shall spell out the description of each piece of equipment (Water Heater #1, for example).

D. Control Device Labels: Install adhesive backed labels inside thermostat and sensor covers to indicate the controlled device. For potentiometers, locate label next to the adjustment knob.

3.17 FIELD QUALITY CONTROL

A. Section 01 40 00 and 01 70 00: Field inspecting, testing, adjusting, and balancing.

B. Provide hydronic radiant pipe manufacturer's representative sign-off that installation meets warranty requirements, prior to placing concrete slabs.

C. On-Site Training for grooved Couplings:
   1. Provide coupling manufacturer's representative to provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products.
   2. The representative is to periodically visit the jobsite and verify installers are following best recommended practices in grooved product installation.

D. Test heating water piping system in accordance with ASME B31.9.

3.18 CLEANING

A. Maintain areas free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash from site periodically and dispose off-site; do not burn or bury.

E. Refer to Section 01 70 00: Requirements for cleaning.

3.19 DEMONSTRATION AND TRAINING

A. Train Owner's maintenance personnel to adjust, operate, and maintain systems and components, including:
   1. Adjusting equipment modes.
   2. Step-by-step procedures associated with:
      a. Start up.
      b. Shut down.
      c. Day-to-day usage.
      d. Emergency shut down.
      e. Emergency and manual operations.
      f. Seasonal change over.
   3. Include a minimum of 8 hours dedicated instructor time on-site.
   4. Review data in maintenance manuals.
   5. Review service requirements and intervals.
   6. Schedule training with Owner, with seven days' advance notice.

END OF SECTION

SECTION 23 05 93

HVAC TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Testing, adjusting, and balancing of air systems.
   2. Measurement of final operating condition of HVAC systems.

1.02 REFERENCES

A. Associated Air Balance Council (AABC):
   1. MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
   1. 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.

C. National Environmental Balancing Bureau (NEBB):
   1. Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

D. Testing Adjusting and Balancing Bureau (TABB):
   1. International Standards for Environmental Systems Balance.

1.03 SUBMITTALS

A. Refer to Section 01 33 00 for administrative procedures.

B. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required. Include detailed procedures, agenda and sample report forms.

C. Prior to commencing Work, submit proof of latest calibration date of each instrument.

D. Test Reports: Indicate data on national organization approved forms.

E. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems.

F. Submit draft copies of report data for review prior to final acceptance of Project.

G. Furnish reports in bound, letter size manuals, complete with table of contents page and indexing tabs.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 70 00: Closeout Procedures.

B. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report for inclusion in operating and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with 1 of the following:
   1. AABC MN-1 National Standards for Field Measurement and Instrumentation.
   2. Total System Balance.
   3. NEBB Quality Assurance Program - Conformance Certification.
   4. TABB Quality Assurance Program for Environmental Systems Balance.

B. Verify and certify that measuring devices have been calibrated within the past 12 months.

1.06 QUALIFICATIONS

A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this Section with minimum 3-years experience certified by AABC, NEBB or TABB.

B. Perform Work under supervision of one of the following:
   1. AABC Certified Test and Balance Engineer.
   2. NEBB Certified Testing, Balancing, and Adjusting Supervisor.
   3. TABB Certified Professional.

1.07 INSTRUMENTATION

A. Provide instrumentation, such as pitot tubes, inclined gauge or U-tube manometers, magnehelic gauges, velometer, direct reading hood, tachometer or rpm counter, insertion thermometers, clamp-on ammeter for motor voltage and ampere readings, and other instruments, required to completely analyze and balance the HVAC systems.

1.08 SEQUENCING

A. Section 01 10 00: Work sequence.

B. Sequence balancing between system installation and Date of Substantial Completion.

PART 2 PRODUCTS

2.01 BELTS AND DRIVES

A. Where factory furnished belts and drives cannot achieve design airflows, replace belts and drives to attain indicated performance.

B. Submit cost of replacement drives and labor to contractor responsible for furnishing the equipment for reimbursement.

2.02 FILTERS

A. Provide one set of clean filters for balancing.

B. Submit cost of replacement filters and labor to contractor responsible for furnishing the equipment for reimbursement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 00: Coordination and Project conditions.

B. Review drawings to verify locations of balancing devices for proper balancing and accessibility.

C. Notify Architect/Engineer of component locations that will inhibit balancing and can be remedied with field modifications to balancing device locations.

D. Verify systems are complete and operable before commencing Work:
   1. Piping and duct systems are flushed clean.
   2. Systems are started and operating in safe and normal condition.
   3. Temperature control systems are installed and operable.
   4. Proper thermal overload protection is in place for electrical equipment.
   5. Air filters and strainers are clean and in place.
   6. Start-up strainers have been removed.
   7. Fans and pumps are rotating correctly.
   8. Fire and volume dampers are in place and open.
   9. Valves are in operating position.
   10. Air coil fins are cleaned and combed.
   11. Access doors are closed and duct end caps are in place.
   12. Air outlets are installed and connected.

3.02 PREPARATION

A. Furnish properly operating instruments required for testing, adjusting, and balancing operations.

3.03 INSTALLATION TOLERANCES

A. Air Handling Systems: With clean filters installed, adjust to plus 15 percent, minus 5 percent of scheduled airflow.

B. Exhaust Fans: Adjust to within plus 10 and minus 0 percent of design.

C. Air Outlets and Inlets: Adjust outlets and inlets to within plus or minus 10 percent of design.

3.04 ADJUSTING

A. Refer to Section 01 70 00: Testing, adjusting, and balancing.

B. Verify recorded data represents actual measured or observed conditions.

C. Report defects and deficiencies noted during performance of services, preventing system balance.

D. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

E. Under Direction of the Commissioning Authority, take measurements to verify balance has not been disrupted. If disrupted, balance to the satisfaction of the Commissioning Authority.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to obtain indicated supply, return, and exhaust air quantities.

B. Measure and document airflow in main ducts by Pitot tube traverse.

C. Measure and document air quantities at air inlets and outlets.

D. Adjust distribution system to minimize objectionable drafts.

E. Use terminal volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.

F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.

G. Measure static air pressure conditions on air supply units, including fan, coil, heat wheel and filter pressure drops.

H. Adjust automatic damper stop positions to balance outside air, return air, and exhaust airflows.

I. Measure the amperes of fan and pump motors before adjusting and balancing. Throttle dampers or valves or reduce equipment speed to correct overload conditions.

J. Discontinue adjusting and balancing if hazardous or dangerous conditions are observed. Follow jobsite safety procedures.

K. Verify outlets for compliance with design requirements and report variations before starting the adjusting and balancing process.

L. At modulating damper locations, take measurements and balance damper end position through software settings or installation of a physical stop where actuator is designed to stall under normal operating conditions.

3.06 BALANCING STANDARDS

A. Instruments used for testing and balancing of air systems must have been calibrated within the past 12 months prior to balancing. Include a letter of certification listing instrumentation used and most recent date of calibration.

B. Include 1 plan review prior to start of construction and 1 on Site inspection during the construction, together with a report on recommended modifications and compliance with requirements of the Specification.

3.07 START-UP AND COMMISSIONING

A. Following Substantial Completion, return to the Site, for up to 4 balancing/ commissioning sessions.

B. Commissioning consists of demonstrating both air and water side systems to the extent required to verify proper operation of system components and controls.

C. Coordinate with automatic temperature controls contractor to make required adjustments.

3.08 SCHEDULES

A. Submit a schedule to the Architect for approval containing the information listed below in tabular form.

B. Equipment requiring Testing, Adjusting, and Balancing:
   1. HVAC pumps.
   2. Desiccant dehumidification unit.
   3. Exhaust and transfer fans.
   4. Air inlets and outlets.
   5. Heat exchangers.
   6. Air coils.
   7. Under floor heat zones.
   8. Unit heaters and cabinet unit heaters.
   9. Water source heat pumps.
   10. Evaporative fluid cooler.
   11. Boilers.
   12. Air handling units.

C. Report Forms:
   1. Title Page
      a. Name, address, telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency.
      b. Project name, location, Architect, Engineer, Contractor and report date.
   2. Summary Comments
      a. Design versus final performance.
      b. Notable characteristics of system.
      c. Summary of outdoor and exhaust flows to indicate building pressurization.
      d. Nomenclature used throughout report.
      e. Test conditions.
   3. Balancing Instrument List
      a. Instrument; Manufacturer, model number, serial number, measurement range and calibration date.
   4. Electric Motors
      a. Manufacturer.
      b. Model/Frame.
      c. HP/BHP and kW.
      d. Phase, voltage, amperage; nameplate, actual, no load.
      e. RPM.
      f. Service factor.
      g. Starter size, rating, heater elements.
      h. Sheave Make/Size/Bore.

5. V-Belt Drive
    a. Identification/location.
    b. Required driven RPM.
    c. Driven sheave, diameter and RPM.
    d. Belt, size and quantity.
    e. Motor sheave diameter and RPM.
    f. Center to center distance, maximum, minimum, and actual.
6. Air Moving Equipment
    a. Location.
    b. Manufacturer.
    c. Model number.
    d. Serial number.
    e. Arrangement/Class/Discharge.
    f. Air flow specified and actual.
    g. Return air flow, specified and actual.
    h. Sheave Make/Size/Bore.
    i. Number of Belts/Make/Size.
    j. Fan RPM.
7. Return Air/Outside Air Data
    a. Identification/location.
    b. Design air flow.
    c. Actual air flow.
    d. Design return air flow.
    e. Actual return air flow.
    f. Design outside air flow.
    g. Actual outside air flow.
    h. Design outside/return air ratio.
    i. Actual outside/return air ratio.
8. Exhaust Fan Data
    a. Location.
    b. Manufacturer.
    c. Model number.
    d. Serial number.
    e. Air flow specified and actual.
    f. Total static pressure (total external), specified and actual.
    g. Inlet pressure.
    h. Discharge pressure.
    i. Sheave Make/Size/Bore.
    j. Number of Belts/Make/Size.
    k. Fan RPM.
9. Duct Traverse
    a. System zone/branch.
    b. Duct size.
    c. Area.
    d. Design velocity.
    e. Design air flow.
    f. Test velocity.
    g. Test air flow.
    h. Duct static pressure.

10. Air Distribution Test Sheet
    a. Air terminal number.
    b. Room number/location.
    c. Design air flow.
    d. Test (final) air flow.
    e. Percent of design air flow.

END OF SECTION

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SECTION 23 07 00

HVAC INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes HVAC Insulation for equipment, piping and ductwork.

B. Related Sections:
   1. Section 23 05 00 - Common Work Results for HVAC:
      a. Hanger sizes for insulated pipes.
      b. Pipe identification.
      c. Extended valve stems for insulated valves.
      d. General material and installation requirements.

1.02 REFERENCES

A. ASTM International (ASTM):
   1. ASTM C165 - "Test Method for Measuring Compressive Properties of Thermal Insulations"
   2. C450 Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
   3. C547 - Standard Specification for Mineral Fiber Pipe Insulation.
   4. C552 – Specification for Cellular Glass Thermal Insulation.
   5. C585 – Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
   6. C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
   7. E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
   8. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   9. C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
   10. C533 - "Specification for Calcium Silicate Block and Pipe Thermal Insulation"
   11. C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
   12. C547 - Standard Specification for Mineral Fiber Pipe Insulation.
   13. C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
   14. C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
   15. C1071 - Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).
   16. C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
   17. C1639 – Standard Specification for Fabrication of Cellular Glass Piping and Tubing Insulation.
   18. D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
   19. E96 - Standard Test Methods for Water Vapor Transmission of Materials.
   20. E2231 - Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics.

B. Sheet Metal and Air Conditioning Contractors (SMACNA):
   1. HVAC Duct Construction Standard - Metal and Flexible.

C. National Fire Protection Association (NFPA):
   1. 255 – Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. Underwriters Laboratories Inc. (UL):
   1. 723 – Tests for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Refer to Section 013300 for submittal procedures.

B. Product Data: Product description, thermal characteristics, ASTM standards compliance.
   1. List specific materials for each service, and location.

1.04 QUALITY ASSURANCE

A. Certify insulation for maximum flame spread index of 25 and maximum smoke developed index of 50 when tested in accordance with ASTM E84, UL-723, and NFPA 255.
   1. Follow mounting procedures of ASTM E2231.
   2. Provide accessories, such as adhesives, mastics, cement, tapes and glass cloth to retain the indicated index rating of the assembly.

B. Manufacture pipe insulation inner and outer diameters in accordance with ASTM C585.

C. Manufacture factory fabricated fitting covers in accordance with ASTM C450.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years of experience.

B. Applicator: Company specializing in performing Work of this section with minimum 3 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemicals, and damage by storing in original wrapping.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:
   1. CertainTeed.
   2. Knauf.
   3. Johns Manville.
   4. Owens Corning.

B. Acceptable Manufacturers for Closed Cell Elastomeric Insulation Products:
   1. Aeroflex. Aerocell.
   2. Armacell, LLC. Armaflex.
   3. Nomaco; FlexTherm.

C. Acceptable Manufacturers for Cellular Glass Insulation Products:
   1. Pittsburg – Corning Foamglas One.

D. Acceptable Manufacturers for Insulation Saddles and Protection Shields:
   1. Anvil (Grinnell).
   2. B-Line - Coopers.
   3. Carpenter and Patterson.
   4. PHD Manufacturing.

E. Acceptable Manufacturers for Insulation Fitting Covers:
   1. Insulated Pipe Shields, LLC (Aluminum).
   2. Johns Manville (Zeston).
   3. Proto.
   4. Speedline.
   5. ITW Insulations Systems (Aluminum).

2.02 PIPE INSULATION

A. TYPE P-2: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
   1. Thermal Conductivity: 0.27 at 75 degrees F.
   2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.
   3. Refer to special insert requirements below.

2.03 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:
   1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
   2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

B. PVC Fitting Covers:
   1. Rated 25/50 for flame spread and smoke developed, tested in accordance with ASTM E84.
   2. Match adjacent PVC jacket thickness where applicable, 20 mil minimum thickness.
   3. 30 mil thickness for outdoor applications and indoor applications within 6 feet of the floor.
   4. White.

C. Aluminum Fitting Covers:
   1. Fabricated from 1100 aluminum alloy, two-piece assembly.
   2. 0.032-inch thickness, 2-1/2 inch size and larger.

D. PVC Plastic Pipe Jacket:
   1. Material compounds in accordance with ASTM D1784. White.
   2. 20 mil sheet material, 30 mil minimum thickness for outdoor applications.
   3. Pressure sensitive color matching vinyl tape joints for hot systems.
   4. Solvent weld seams for outdoor use and systems operating below ambient temperatures.

E. Aluminum jacket:
   1. Type T-3003 H-14 sheet.
   2. 0.016 inch minimum thickness, smooth or embossed pattern.
   3. Secured with 1/2-inch wide 0.020-inch thick type 304 stainless steel bands.

2.04 INSULATION ACCESSORIES

A. Adhesives and mastic: Compatible with insulation and jacket materials.
   1. Adhesive for cellular glass: Pittseal Cw.
   2. Mastic for cellular glass: Pittcote 404 coating.

B. Vapor Retarder Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive.

C. Piping 1-1/2 Inches Diameter and Smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.

D. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum jacket single piece construction with self-adhesive closure. Thickness to match pipe insulation.

2.05 SHEET METAL BLANK OFFS

A. Wall louvers:
   1. Double wall anodized or galvanized sheet metal panels.
   2. Insulated with 2 inch thick, 3-pound density glass fiber insulation.
   3. Duct gage in accordance with SMACNA HVAC Duct Construction Standards for 1/2 inch pressure classification; no cross-breaking.
   4. Surfaces visible through the louver: Painted or anodized black.

2.06 DUCTWORK INSULATION

A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied FSK jacket meeting ASTM C1136, Type II.
   1. Thermal Conductivity: 0.27 at 75 degrees F.
   2. Maximum Operating Temperature: 250 degrees F.
   3. Density: 0.75 pound per cubic foot.

B. Type D-2: ASTM C612, Type IA or IB, rigid glass fiber, with factory applied jacket meeting ASTM C1136, Type II:
   1. Thermal Conductivity: 0.24 at 75 degrees F.
   2. Density: 3.0 pound per cubic foot.

C. TYPE D-3: ASTM C1071, Type I, flexible, glass fiber duct liner with coated air side.
   1. Thermal Conductivity: 0.24 at 75 degrees F.
   2. Density: 1.5 pound per cubic foot.
   3. Maximum Operating Temperature: 250 degrees F.
   4. Maximum Air Velocity: 6,000 feet per minute.

2.07 DUCTWORK INSULATION JACKETS (FIELD APPLIED)

A. Aluminum Duct Jacket:
   1. ASTM B209.
   2. Thickness: 0.016 inch thick sheet.
   3. Finish: Smooth or diamond pattern.
   4. Joining: Longitudinal slip joints and 2 inch laps.
   5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

B. Vapor Retarder AP Jacket:
   1. White kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Water Vapor Permeance: ASTM E96; 0.02 perms.
   3. Secure with pressure sensitive tape.

A. Flexible Self-Adhesive Cladding
   1. Manufacturers and trade names:
      a. Polyguard – Alumaguard.
      b. VentureClad - 1577CW.
   2. Description:
      a. Thickness: 5.5 to 6 mil.
      b. Density: 0.3 pounds per square foot.
      c. Water Vapor Permeability (ASTM E96): 0.00 perms.
      d. Puncture Resistance (ASTM D 1000): 35.4 pounds.
      e. Tear Strength (ASTM D 624): 8.5 pounds.

2.08 INSULATION SHIELDS, SADDLES AND INSERTS

A. Insulation protection shields at hangers:
   1. Galvanized steel, minimum length: 12 inches.
   2. MSS SP-69, Type 40.
   3. Thickness:
      a. 5.7 inch diameter and smaller: 18 gauge galvanized steel.
      b. 5.7 inch to 11 inch diameter: 16 gauge galvanized steel.
      c. Larger than 11 inch diameter: 14 gauge galvanized steel.

B. Pipe Saddles for Pipes 4 inch and larger:
   1. Exposed and non-plenum locations: Wood insulation saddle, hard maple. Inserts length: not less than insulation shield length, matching thickness and contour of adjoining insulation.
   2. Plenum locations and where roll hangers are used: Carbon steel saddle with glass fiber or calcium silicate insert shaped to match pipe and saddle contours.

C. Closed Cell Elastomeric Insulation Insert:
   1. Polyurethane insert to fully surround pipe.
   2. Thickness to match pipe insulation.

3. Tyco PUN series or Tyco KS series; or equivalent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Coordinate sleeved openings with pipe and duct installers prior to setting sleeves to ensure adequate openings for insulation through floor and wall penetrations.

B. Verify piping, equipment, and ductwork has been tested before applying insulation materials.

C. Verify surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION – ELASTOMERIC FOAM

A. Pipe and Fittings:
   1. Slip insulation over pipe before assembly.
   2. Insulate fittings with matching insulation.
   3. Insulate at hangers with polyurethane inserts.
   4. Paint insulation exposed to weather with alkydchorinated - rubber paint.

3.03 INSTALLATION - PIPING

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of 1 hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than 1 hour.

C. Piping Systems Conveying Fluids Below Ambient Temperature:
   1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
   2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
   3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

D. Hot Piping Systems less than 140 degrees F:
   1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
   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.
   3. Insulate unions and flanges at equipment with removable insulation bands held in place with aluminum straps.

E. Insulation jacket protection shields:
   1. Install galvanized steel shield between pipe hanger and insulation jacket.
   2. Piping Supported by Roller Type Pipe Hangers:
      a. Install galvanized steel shield between roller and inserts.

F. Saddles and Inserts For piping 3" and larger:
   1. Tack weld or otherwise secure saddle to bottom of piping.
   2. Install insert to completely fill the void between the pipe and the saddle.
      a. Insert Configuration: Thickness and contour matching pipe and interior of saddle.

G. Closed Cell Elastomeric Insulation:
   1. Push insulation on to piping.
   2. Miter joints at elbows for copper piping systems with sweat fittings.
   3. Seal seams and butt joints with manufacturer's recommended adhesive.
   4. When application requires multiple layers, apply with joints staggered.
   5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.

H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces less than 8 feet above finished floor: Finish with PVC jacket and fitting covers.

I. Refer to insulation schedule for applicable types and thicknesses.

3.04 INSTALLATION - DUCTWORK

A. Duct dimensions indicated on Drawings are free area dimensions.

B. Insulated ductwork conveying air below ambient temperature:
   1. Provide insulation with vapor retarder jackets.
   2. Finish with tape and vapor retarder jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire damper sleeves and flexible connections.

C. Insulated ductwork conveying air above ambient temperature:
   1. Provide with or without vapor retarder jacket, but provide insulation jacket.
   2. Insulate fittings and joints. Bevel and seal exposed ends of insulation.

D. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 8 feet above finished floor): Finish with aluminum jacket.
   1. Jacket entire duct if bottom is within 8 feet of floor.

E. External Glass Fiber Duct Insulation:
   1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
   2. Secure insulation without vapor retarder with staples, tape, or wires.
   3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
   4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
   5. Taper and seal insulation around access doors and damper operators to allow operation without interference.

F. Insert high density spacers of equal thickness as insulation at trapeze hanger locations.

G. Prepare duct insulation for finish painting. Refer to Section 09 91 00.

H. Apply insulation in accordance with the manufacturer's published recommendations.

I. Exterior Duct Insulation (Rigid):
   1. Apply with edges tightly butted and impaled over welded pins and secured with clips. Place pins to hold insulation securely, but not over 18 inches on center. Seal joints with FSK tape.
   2. Apply roll type aluminum corner bead at corners. Apply canvas or glass fabric as finish over FSK embedding the fabric in a coat of adhesive. Apply a finish brush coat of adhesive over fabric.

J. Outside Air, Combustion Air and Exhaust Air Duct Insulation:
   1. Apply insulation to extend to and contact wall or roof deck.
      a. Secure insulation jacket to metal with pressure sensitive vapor barrier tape leaving no voids at edges.
   2. Seal butt joints with 3 inches wide joint sealing tape and seal corner joints with 4-inch wide tape. Seal pin clip locations with tape patches.

K. Exposed Air-Conditioned Supply and Return Duct Insulation:
   1. Apply insulation to supply and return air ducts exposed in non-air-conditioned mechanical rooms and unfinished spaces.
   2. Secure insulation to metal with welded pins and mechanical fasteners on not over 18-inch centers leaving no voids at edges. Seal butt joints with 3 inches wide joint sealing tape and seal corner joints with 4-inch wide tape. Seal over pin clips with tape patches.

L. Concealed Air-Conditioned Supply and Return Duct Insulation:
   1. Apply insulation to supply and return air ducts.
   2. Secure insulation to metal with strips of insulation adhesive leaving no voids at edges. Further secure the bottom side insulation on ducts over 24 inches wide with welded pins and mechanical fasteners on not over 18-inch centers. Lap joints 2 inches, seal with lap adhesive and staple 6 inches on center. Seal over staples and fasteners with matching tape patch.

3.05 PAINTING

A. Prepare duct insulation for finish painting. Refer to Section 09 91 00.

B. Prepare exposed, unfinished duct jacket, fittings, supports, and accessories ready for finish painting.
   1. Acrylic Finish: Two finish coats over a primer that is compatible with material and finish coat paint.
   2. Color: Final color as selected by Architect.

3.06 SCHEDULES

A. Cooling Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches	JACKET REQUIREMENT
Condensate Piping from Cooling Coils	P-2	All sizes	0.5	None
Refrigerant Suction	P-2	3/4 inch and smaller	0.5	PVC (Exterior only)
Refrigerant Suction	P-2	1 inch and larger	1.0	PVC (Exterior only)

(VB) Requires vapor barrier jacket and sealed joints.

B. Ductwork Insulation Schedule:

DUCTWORK SYSTEM	INSULATION AND JACKET TYPE	INSULATION THICKNESS** (inches)
Outside Air Intake	D-2, FSK	2.0
Insulation for Combustion Air	D-2, FSK	2.0
Supply Air Ducts exposed to view	D-2, FSK	1.0
Return Air Ducts (lined)	D-3	1.0
Return Air Ducts (lined) within 10 feet of air handler	D-3	1.0
Supply Air Ducts concealed above ceiling	D-1, FSK	1.5*
Exhaust Air Ducts within 10 feet of exterior openings (concealed)	D-1, FSK	1.5*
Exhaust Air Ducts within 10 feet of exterior openings, exposed to view	D-2, FSK	1.5
Ductwork routed in unheated spaces (attics, crawlspace, carports, etc.)	D-2, FSK	2.0
Transfer Air Ducts (lined)	D-3	1.0

DUCTWORK SYSTEM	INSULATION AND JACKET TYPE	INSULATION THICKNESS** (inches)
Ductwork routed outside building envelope	D-2, Self adhesive cladding	2.0

* Uncompressed thickness.
**R-value of interior lining can be used to offset required thickness of exterior duct insulation.

END OF SECTION

SECTION 23 09 00

INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Control Devices
      a. Control panel enclosures and controllers.
      b. Humidity sensors.
      c. Thermostats and temperature sensors.
      d. Electronic damper actuators.
      e. Duct Smoke Detectors
   2. Device communication wiring.

B. Related Sections:
   1. Section 23 09 93 - Sequence of Operations for HVAC.
   2. Section 23 33 00 - Air Duct Accessories.
   3. Division 26- Electrical.

1.02 SYSTEM DESCRIPTION

A. The Contractor shall design and provide a complete, electrically-supervised, non-coded, control system as indicated.

B. Control system consists of sensors, indicators, actuators connected to distributed controllers factory programmed to control mechanical systems.

1.03 REFERENCES

A. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
   1. 62 - Ventilation for Acceptable Indoor Air Quality.

B. National Electrical Manufacturers Association (NEMA):
   1. DC 3 - Residential Controls - Electrical Wall Mounted Room Thermostats.
   2. 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. National Fire Protection Association (NFPA):
   1. 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

1.04 SUBMITTALS

A. Section 01 33 00: Submittal Procedures.

B. Shop Drawings:
   1. System configuration drawings showing controller connections to peripheral devices, unitary devices, sensors and switches.
   2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

3. Written sequence of operation. Coordinate submittals with information in Section 23 09 93.

C. Product Data: Submit description and engineering data for each control system component.
   1. Environmental limits for storage and operation.
   2. Operational (output) range.
   3. Input requirements.
   4. Power consumption and requirements.

D. Manufacturer's Installation Instructions: Submit installation requirements for each control component.

1.05 CLOSEOUT SUBMITTALS

A. Record Documents: Record actual locations of control components, including panels, thermostats, and sensors.

B. Operation and Maintenance Data:
   1. Refer to Section 01 78 23 Operation and Maintenance Manuals.
      a. Model numbers and serial numbers of control devices.
      b. Testing and diagnostic procedures for each type of control device.
      c. Interconnection wiring diagrams with numbered system components and devices.
      d. Approved shop drawings and product data.
      e. Warranties.
   2. Submit inspection period, cleaning methods, recommended cleaning materials.
   3. Calibration records, calibration tolerances and adjustment procedures.

1.06 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum of 5-years' experience.

B. Installer: Company specializing in performing Work of this Section with minimum of 5 years' experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00: Product storage and handling requirements.

B. Accept controls on site in original factory packaging Inspect for damage.

1.09 COORDINATION

A. Section 01 31 00: Requirements for coordination.

B. Coordinate location of thermostats, temperature sensors, humidity/dew point sensors, and other exposed control sensors with plans and room details before installation.

C. Coordinate supply of conditioned electrical circuits for control units.

1.10 WARRANTY

A. Section 01 78 36: Product Warranties.

1.11 MAINTENANCE SERVICE

A. Furnish service and maintenance of control system for 1 year from Date of Substantial Completion.

B. Perform work without removing units from service during building normal occupied hours.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
   1. Alerton Technologies, Inc.
   2. American Automatrix.
   3. Andover Controls Corporation.
   4. Belimo.
   5. Delta Controls, Inc.
   6. Honeywell.
   7. Invensys.
   8. Johnson Controls.
   9. KMC.
   10. Siemens.
   11. Trane.
   12. Veris Industries.

2.02 CONTROL PANELS

A. Local Control Panels: Unitized cabinet with suitable brackets for wall or floor mounting, located adjacent to each system under automatic control. Provide common keying for all panels.
   1. Fabricate panels of 0.06-inch thick, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish.
   2. Panel-Mounted Equipment: Temperature and humidity controllers, relays, and automatic switches; except safety devices. Mount devices with adjustments accessible through front of panel.
   3. Door-Mounted Equipment: Flush-mount (on hinged door) manual switches, including damper-positioning switches, changeover switches, thermometers, and gauges.

2.03 CONTROLLERS

A. Economizer controller; Basis of Design: Johnson Controls, model AD-DME400-0:
   1. Pre-programmed electric controller with modulating output signal for damper positioning.
      a. M9204, 12 pin stepper motor actuator control.
   2. Analog inputs for humidity/dew point sensors for outside air and return air.
   3. Analog inputs for temperature sensors for outside air, return air and discharge air.

4. Potentiometers for setting:
    a. Discharge (supply) air temperature setting.
    b. Minimum ventilation position.
    c. Economizer lockout setting.
5. Provide transformer for 24 VAC controller power requirements.

2.04 HUMIDITY AND TEMPERATURE SENSORS

A. Return air and mixed air humidity sensors; Basis of Design: Johnson Controls HE-67N3:
    1. Duct mounted, proportioning type, bulk polymer sensor element.
    2. Accuracy: +/-3 percent full range with linear output.
    3. Operating range: 0 to 100 percent relative humidity.
    4. Maximum operating temperature: 140 degrees F.
    5. Temperature sensor: 1.0k ohm nickel RTD with linear resistance from 0 degrees F to 140 degrees F.

2.05 THERMOSTATS

A. Thermostat:
    1. Line voltage On/Off thermostats: bi-metal actuated contacts or bellows actuated snap switch, U.L. Listed, locking metal cover, and visible thermometer.
        a. Rated for current draw of controlled device.
        b. Adjustable.
    2. Low voltage with transformer: control range suitable for the specific application.
        a. Factory calibrated.
        b. Provide correct steps/stages to accomplish the specified sequences.

2.06 TEMPERATURE SENSORS

A. Thermistor temperature sensors as follows:
    1. Accuracy: Plus or minus 0.5 degree F at calibration point.
    2. Wire: Twisted, shielded-pair cable.
    3. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
    4. Averaging Elements in Ducts: 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 9 sq. ft.; length as required.
    5. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
    6. Room Sensors: Match room thermostats, locking cover.
    7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

B. Resistance Temperature Detectors: Platinum.
    1. Accuracy: Plus or minus 0.2 percent at calibration point.
    2. Wire: Twisted, shielded-pair cable.
    3. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
    4. Averaging Elements in Ducts: 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 9 sq. ft.; length as required.
    5. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
    6. Room Sensors: Match room thermostats, locking cover.
    7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

2.07 ELECTRIC OPERATORS

A. Furnish operators for motor operated dampers not furnished under other Sections.

B. Operators shall be sized to operate their appropriate dampers or valves with sufficient reserve power to provide smooth modulating action or 2-position action as specified.

C. When so specified in the sequence of operation or where more than 2 actuators are to be operated in sequence to each other, provide position feedback positive positioners with adjustable start point and operating range.

2.08 DAMPER ACTUATORS

A. Manufacturers:
   1. Belimo.
   2. Honeywell.
   3. Johnson.
   4. Other manufacturers listed in Article 2.01 A.

B. Proportional, modulating or 2-position damper actuator, electronic, direct coupled type, U.L. Listed. Spring return or non-spring return as specified or required by the sequence of control. Non-spring return actuators have reversing switch and gear disengagement button on cover.

C. Electronically protected from overload at all angles of rotation.

D. Wherever possible, locate actuators out-of-the airstream.

E. Power: 10 VA at 24vac or 8W at 24vdc.
   1. Provide 120V transformers.

F. Torque: Size for minimum 150 percent of required duty.

G. Duty Cycle: rated for 60,000 full stroke cycles at rated torque.

H. Accessories:
   1. Damper linkage.
   2. Field selectable rotational, spring return direction, field adjustable zero and span.

2.09 DAMPER ACTUATORS (2 POSITION)

A. Two-position damper actuator, electronic, direct coupled type, U.L. Listed. Spring return or non-spring return as specified or required by the sequence of control. Non-spring return actuators have reversing switch and gear disengagement button on cover.

B. Electronically protected from overload at all angles of rotation.

C. Wherever possible, locate actuators out-of-the airstream.

D. Power: 120 VAC, 10 W. [10 VA at 24vac or 8W at 24vdc.]

E. Torque: Size for minimum 150 percent of required duty.

F. Duty Cycle: rated for 60,000 full stroke cycles at rated torque.

G. Accessories:
   1. Damper linkage.
   2. Field selectable rotational, spring return direction, field adjustable zero and span.

2.10

2.11 RELAYS AND SWITCHES

A. Furnish relays and switches required for the successful operation of the system. Include suitable indicating plates. Include positive positioning devices on operators where sequencing is specified.

2.12 MANUAL (HAND CRANK) TIMERS

A. Xxx

2.13 PRESSURE AND FLOW SENSORS

A. xxx

2.14 CURRENT SENSORS

A. Current Sensing Relay:
   1. Monitors ac current.
   2. Independent adjustable controls for pickup and dropout current.
   3. Energized when supply voltage is present and current is above pickup setting.
   4. De-energizes when monitored current is below dropout current.
   5. Dropout current is adjustable from 50 to 95 percent of pickup current.
   6. Include a current transformer, if required for application.
   7. House current sensing relay and current transformer in its own enclosure. Use NEMA 250, Type 12 enclosure for indoors and NEMA 250, Type 4 for outdoors.

B. Combination On-Off Status Sensor and On-Off Relay:
   1. Description:
      a. On-off control and status indication in a single device.
      b. LED status indication of activated relay and current trigger.
      c. Closed-Open-Auto override switch located on the load side of the relay.
   2. Performance:
      a. Ambient Temperature: -30 to +140 deg F.
      b. Voltage Rating: Single-phase loads rated for 300-V ac. Three-phase loads rated for 600-V ac.
   3. Status Indication:
      a. Current Sensor: Integral sensing for single-phase loads up to 20 A and external solid or split sensing ring for three-phase loads up to 150 A.
      b. Current Sensor Range: As required by application.
      c. Current Set Point: Fixed or adjustable as required by application.
   4. Relay: Single-pole double-throw, continuous-duty coil; rated for 10-million mechanical cycles.

2.15 DUCT SMOKE DETECTORS [TYP DIV 26/28 BY ELECTRICAL]

A. Description: Photoelectric-type, duct-mounted smoke detector.

B. Performance Criteria:
   1. Regulatory Requirements:
      a. NFPA 72.
      b. UL 268A
   2. General Characteristics:
      a. Detectors must be [four] [two]-wire type.
      b. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
      c. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
      d. Integral Visual-Indicating Light: LED type, indicating detector has operated[and power-on status].
      e. Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
      f. Operator at FACU, having designated access level, must be able to manually access the following for each detector:
         1) Primary status.
         2) Device type.
         3) Present average value.
         4) Present sensitivity selected.
         5) Sensor range (normal, dirty, etc.).
      g. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with supplied detector for smoke detection in HVAC system ducts.
      h. Each sensor must have multiple levels of detection sensitivity.
      i. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
      j. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.
   3. Basis of Design:

2.16 NONSYSTEM SMOKE DETECTORS

A. Single-Station Duct Smoke Detectors:
   1. Performance Criteria:
      a. Regulatory Requirements:
         1) NFPA 72.
         2) UL 268A.
   2. General Characteristics:
      a. Sensor: LED or infrared light source with matching silicon-cell receiver.
      b. Base Mounting: Detector and associated electronic components must be mounted in twist-lock module that connects to fixed base. Fixed base must be designed for mounting directly to air duct. Provide terminals in fixed base for connection to building wiring.
         1) Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; listed for use with supplied detector.
      c. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
   3. Basis of Design: Sensor System model D4120

2.17 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Perform wiring necessary for the temperature control system unless specifically indicated otherwise.

B. Provide conduit, electrical wiring and junction boxes in accordance with Division 26 and in accordance with conduit types and electrical classifications as shown on the Electrical Drawings.

C. Install HVAC control circuitry within its own conduit systems provided under this Section. Do not install HVAC control circuitry within conduit systems that are shown on the Electrical Drawings.

D. Electrical Characteristics: In accordance with Division 26.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 00: Coordination and project conditions.

B. Verify that conditioned power is available to control units.

C. Verify location of thermostats and humidistats and other exposed control sensors with Drawings before installation.

D. Verify building systems to be controlled are ready to operate.

3.02 INSTALLATION

A. Install thermostats, space temperature sensors, after locations are coordinated with other Work.

B. Install thermostats, 48 inches above floor. Align with light switches. Install room temperature and humidity sensors 60 inches above the floor. Align with light switches. Do not install temperature sensors directly above dimmers.

C. Mount thermostats located on cold walls on an insulated backplate. Seal penetrations through wall airtight.

D. Refer to Division 26 for installation of smoke and heat detectors.

E. Connect and configure equipment to achieve sequence of operation specified.

F. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

G. Label visible sensors as to function and controlled device. Conceal labels behind device cover.

H. Install labels and nameplates to identify control components according to Section 23 05 00.

I. Install control panels adjacent to associated equipment on walls or freestanding supports. Install engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates for control panel on cabinet face. Label with equipment or system designation.

J. Install conduit and electrical wiring in accordance with Division 26.

3.03 FIELD QUALITY CONTROL

A. Provide commissioning report indicating that each point has been tested for proper wiring termination and functionality.

B. Testing and Adjusting:
   1. Test control functionality at the device and system levels prior to Owner training.
   2. Calibrate and adjust control settings to achieve stable output signals.

C. Replace damaged or malfunctioning controls.

3.04 DEMONSTRATION

A. Demonstrate room temperature and humidity sensor calibration to the satisfaction of the Engineer.

B. Demonstrate control sequences to the Owner and engineer.

3.05 TRAINING

A. Train Owner's maintenance personnel to adjust, operate, and maintain control systems and components, including:
   1. Adjusting equipment modes.
   2. Step-by-step procedures associated with function key commands and day-to-day usage.
   3. Include a minimum of 2 hours dedicated instructor time on-site.
   4. Review data in maintenance manuals.
   5. Schedule training with Owner, with seven days' advance notice.

3.06 ON-SITE ASSISTANCE

A. Occupancy Adjustments: Within 1 year of date of Substantial Completion, provide up to 2 Project site visits, when requested by Owner for the following:
   1. Adjust and calibrate components identified by the Owner as out of calibration.

3.07 EQUIPMENT

A. Provide insulated backplate where thermostats and temperature sensors are on exterior walls.

B. Seal thermostat subbase and sensor backs to prevent airflow from wall cavity to the space.

C. Furnish motor operated dampers that are not furnished with louvers, gravity vents and fans. Refer to those sections for dampers to be provided with equipment.

D. Label thermostats and sensors to identify controlled device and initial temperature setting.

3.08 SEQUENCE OF OPERATIONS

A. Refer to Section 23 09 93: Sequence of Operations.

END OF SECTION

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SECTION 23 09 93

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Abbreviations used in this section.
   2. Operational modes.
   3. Adjustable variables and global settings.
   4. Monitoring and trend logs.
   5. Sequence of operation for:
      a. Automatic Control Valves.
      b. Hydronic Pumps.
      c. Control Dampers.
      d. HVAC Fans.
      e. VAV Terminals.
      f. HVAC Gravity ventilators.
      g. Ventilation Hoods.
      h. Boilers.
      i. Furnaces.
      j. Fuel Fired Heaters.
      k. Air Cooled Condensing Units.
      l. Reciprocating Water Chillers.
      m. Scroll Water Chillers.
      n. Rotary-Screw Water Chillers.
      o. Cooling Towers.
      p. Liquid Coolers.
      q. Heat-Wheel Energy Recovery Equipment.
      r. Fixed-Plate Energy Recovery Equipment.
      s. Packaged Air-to-Air Energy Recovery Units.
      t. Indoor Central-Station Air-Handling Units.
      u. Indoor, Gas-Fired Heating and Ventilating Units.
      v. Hydronic Duct Heating Coils.
      w. Finned-Tube Radiation Heaters.
      x. Unit Heaters and Cabinet Unit Heaters.
      y. Radiant Heating Units.
      z. Air Curtains .
      aa. Dehumidification Units.
      bb. Desiccant Dehumidification Units.

B. Related Sections - Control equipment:
   1. Section 23 09 00 - Instrumentation and Control for HVAC.

C. Related Sections - Equipment furnished with integral controls:
   1. Section 23 21 23 - Hydronic Pumps (Grundfos speed selector switch).
   2. Section 23 34 00 - HVAC Fans (Greenheck vari-green motor speed control).
   3. Section 23 52 00 - Heating Boilers (sequencing, safety and operating controls).
   4. Section 23 55 00 - Fuel Fired Heaters (burner safety and firing controls).

5. Section 23 65 00 - Cooling Towers (sump float valve).
6. Section 23 72 00 - Air-to-Air Energy Recovery Equipment (wheel speed modulation).
7. Section 23 73 00 - Indoor Central Station Air-Handling Units.
8. Section 23 81 46 - Water Source Unitary Heat Pumps (refrigeration controls).
9. Section 23 82 39 - Unit Heaters (with integral thermostats).
10. Section 23 84 16/17 - Dehumidification Units (operating controls).
11. Section 23 84 19 - Desiccant Dehumidification Units (operating controls).

1.02 CONTROL SYSTEM DESCRIPTION

A. Complete digital energy management system controlling equipment using programmed scheduling, control logic and user interface at the central station as well as occupant override capability at the zone level.

B. DDC monitoring and control by building automation system:
   1. Programmed Occupied /Unoccupied mode with operator override.
   2. Programmed Summer/Winter mode with operator override.
   3. Outdoor reset of heating water temperatures to match conduction and ventilation loads.
   4. Data logging and trend reporting of control points.
   5. Cumulative energy consumption calculations based on accumulated data and flow conditions.
   6. Alarm generation for temperature/pressure/operating parameters beyond the control settings.

C. Settings and control parameters including temperatures, pressures and start/stop times are to be adjustable from the control system operator interface with password clearance.

D. Provide (1 minute; minimum) time delay on checking alarm conditions after commanding a change of state.

E. [for non-DDC systems] The Contractor shall design and provide a complete, electrical, non-coded, control system as indicated.

1.03 DEFINITIONS

A. “Throttling range": used herein to establish a general responsiveness for P-I and PID control.
   1. Tune the P-I and PID settings to respond similar to proportional control with the specified throttling range.

1.04 ABBREVIATIONS

A. For this Section, a number followed by an "F" means temperature in degrees Fahrenheit.

B. AHU - air handling unit (includes energy recovery units and roof mounted air conditioning units).

C. CO2 - carbon dioxide.

D. DAT - discharge air temperature (usually supply duct temperature).

E. LAT - leaving air temperature (usually after passing through heating or cooling coil).

F. MA/MAT - mixed air / mixed air temperature (leaving filter section).

G. NOx – mono-nitrogen oxides (NO-nitric oxide and NO2-nitrogen dioxide).

H. OA/OAT - outside (ambient) air / outside air temperature.

I. P-I - proportional and integral control algorithm, controls to setting with zero offset.

J. PID - proportional, integral and derivative control algorithm; controls to setting with zero offset including a response time component.

K. PPM - parts per million.

L. % rh - percent relative humidity.

M. RA/RAT - return air / return air temperature.

N. rh - relative humidity.

O. SA/SAT - supply air / supply air temperature.

P. VFD - Electronic motor speed controller, modulating output.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 OPERATIONAL MODES

A. Commissioning Mode.
   1. Provide the system operator with access to a commissioning mode.
   2. In this mode, the operator may reset inputs to simulate varying conditions in order to commission the system. For example, the operator could reset the outside temperature to 29F to verify the operation of a heating water valve that opens below 30F outdoor temperature.
   3. Automatically revert to normal (non-commissioning) mode by either operator input or by not being in use for 60 minutes (adjustable).

B. Summer/Winter mode (global mode affecting entire building)
   1. Selectable from main screen of operator interface.
   2. Summer mode:
      a. Control valves serving vestibule heaters, AHU heating coils and finned tube radiation are set to prevent fluid flow to the heating device.
      b. In-floor heating pump is disabled.
      c. Heating pumps, VAV heating coil controls and baseboard radiation control valves are enabled
      d. Provide an alarm if Summer mode is not selected and temperatures remain above 50 degrees F for 24 hours.
      e. Provide a data log for operator override of Summer mode lockouts.
   3. Winter mode:

a. Control valves serving evaporative fluid cooler and air cooled condensing unit solenoid valves are set to prevent flow to the devices.
b. Secondary heating pump and boilers and boiler pumps are enabled.
c. Provide an alarm if Winter mode is not selected and temperatures remain below 40 degrees F for 24 hours.
d. Provide a data log for operator override of Winter mode lockouts.

C. Start-up, Occupied and Unoccupied modes (selectable on a zone-by-zone basis)
1. Scheduling function within DDC system to indicate operational mode for each zone containing a room temperature sensor, CO2 sensor or humidity sensor.
2. Identify and provide operator override of zone-by-zone occupancy mode from a single display screen, including global commands:
a. Change all zones to occupied mode with elimination of start-up mode.
b. Change all zones to unoccupied mode.
c. Reset occupied zone temperature settings to global occupied temperature.
d. Reset unoccupied zone temperature settings to global unoccupied temperature.
3. Occupied mode:
a. Occupied mode is programmed into a recurring, week long schedule accessible from the main display screen of the operator interface.
1) Adjustments to daily scheduling do not result in changes to the recurring schedule.
2) Owner will provide occupied schedule information prior to programming.
b. Generally, Occupied mode affects settings for zone temperatures and ventilation damper positioning.
1) Maintain zone temperatures at zone temperature settings.
2) Maintain zone humidity at or below zone humidity settings (where applicable).
3) Maintain ventilation at scheduled minimum ventilation rate unless overridden by economizer cooling or demand controlled ventilation requirements.
4) Supply units and exhaust fans are to operate continuously.
5) Heating and cooling plants are enabled and activated when called for.
4. Start-up mode:
a. Start-up mode is the time spent changing a zone from the unoccupied zone temperature to the occupied zone temperature setting.
b. The start-up time for each zone is determined based on past performance at similar outside air temperature conditions.
c. The DDC system uses zone-by-zone optimization to determine when to enter the start-up mode, so occupied conditions occur when Occupied mode begins.
d. Disable Low zone temp. alarms while the zone temperature rises to the occupied setting.
5. Unoccupied mode:
a. Unoccupied mode occurs when a zone is not in Occupied or Start-up modes.
b. General zone conditions:
1) Temperatures drift to less energy intensive settings.
2) Ventilation dampers are closed.
3) Airside equipment such as heat pumps and air handling units are off, unless operation is needed to maintain temperatures within the unoccupied setting deadband.

3.02 ADJUSTABLE VARIABLES AND GLOBAL SETTINGS

A. Modify software to allow adjustment of parameters, settings, limits, alarm conditions, throttling ranges, deadband, variables, etc. at the operator interface.

B. Global settings (initial values):
   1. Zone Temperature:
      a. Heating: 72F occupied mode, 68F unoccupied mode.
      b. Cooling: 74F occupied mode, 78F unoccupied mode.
      c. Alarm: “High/Low Zone Temp.” if 2F above or below setting.
   2. Zone Relative Humidity:
      a. Cooling: 55 percent maximum.
      b. Alarm: “High/Low Zone RH” if 5 percent above setting.
   3. Zone Carbon Dioxide Concentration:
      a. 750 ppm above ambient. Set at 1100 ppm initially. Only controlled in occupied mode.
      b. Alarm: “High Zone CO2” 100 ppm above setting.

3.03 SYSTEM MONITORING REQUIREMENTS

A. Monitor and log the input data, output signals and status of the listed devices and the HVAC equipment where sequences of operation are specified.
   1. Create trend logs for representative equipment to demonstrate this functionality.
   2. Log the data with side-by side comparisons to the settings to be maintained.
   3. Display the results graphically for user programmable time periods.
   4. Provide memory and storage capability to save two weeks of complete trend data.
   5. Delete oldest data to save new data upon reaching capacity of the available memory.

B. Record in non-volatile memory, a record of alarms generated during system commissioning.

C. Maintain in non-volatile memory, a record of alarms generated after Date of Substantial Completion.

3.04 CONTROL VALVE SEQUENCES

A. Gas Appliance Control Valves: Sections
   1. Solenoid and modulating gas valves are controlled by the appliance they serve.
   2. No interface with the DDC system.

B. Heat Exchanger Control Valve:
   1. Control valve for core water loop heat exchanger
      a. Inputs: Core water supply temperature. Core water return temperature.
      b. Devices: Core water supply and return temperature sensors.
      c. Sequence:
         1) Modulate valve to maintain core water supply temperature to not exceed 90 degrees F.
         2) Close valve to heat exchanger if core water return temperature is below 70 degrees F.
      d. Alarm: "Check Core Water HX" for core water supply temperatures above 90 degrees F.

C. AHU Heating Water Control Valve:
   1. Input: Supply air temperature setting.
   2. Device: Supply duct temperature sensor.
   3. Sequence: Maintain supply air at SAT setting by modulating valve through P-I control loop.

4. Throttling range: 4F; 100 percent open at 2 degrees F below setting.
5. Discrete Conditions:
   a. Disable alarm in start-up mode.
6. Alarm: “Low AHU Supply Temp.” for zone temperature 5 degrees F below temperature setting.

D. Zone Heating Control Valve (typical for baseboard radiation , duct heating coils and radiant panels):
1. Input: Zone temperature.
2. Device: Zone temperature sensor.
3. Sequence: Maintain zone temperature by modulating valve through P-I control loop.
4. Throttling range: 4 degrees F; 100 percent open at 2 degrees F below setting.
5. Discrete Conditions: Disable alarm in start-up mode.
6. Alarm: “Low Zone Temp.” for zone temperature 3 degrees F below temperature setting.

E. Zone Heating Control Valve (for in-floor hydronic heating piping):
1. Input: Zone temperature. Slab temperature.
2. Device: Zone temperature sensor. Embedded slab temperature sensor.
3. Sequence: Maintain slab temperature by modulating valve through P-I control loop.
4. Reset slab temperature setting to maintain zone temperature setting.
5. Throttling range: 4 degrees F; 100 percent open at 2 degrees F below setting.
6. Discrete Conditions: Disable alarm in start-up mode.
7. Alarm: “Low Slab Temp.” for slab temperature 3 degrees F below temperature setting.

3.05 HYDRONIC PUMPS:

A. Boiler Pumps (P-_, P-_, P-_, P-_ and P-_, also may be referred to as primary pumps)
1. Local boiler control activates pump when boiler sequencer calls for corresponding boiler operation.
2. Current sensor on pump motor wiring provides status at operator interface.
3. Alarm: Pump status different from boiler status (10 second time delay).

B. Heating Water Pumps (P-_, P-_, also may be referred to as secondary pumps)
1. One pump operates to satisfy light load requirements (Lead pump).
2. Last pump to start is designated as Lead pump following pump shut-down.
3. Activate Lag pump upon failure of Lead pump.
4. Lead pump starts when:
   a. System is in Winter mode.
5. Pump stops when:
   a. System is in Summer mode.
6. Lag pump starts when outside air temperature is below 10 degrees F. Pumps operate in parallel.
7. Lag pump stops when outside air temperature rises above 15 degrees F.
8. Current sensor establishes pump status for each pump.
9. Annunciate Lead pump selection on heating system display of operator interface.
10. Alarms: 1) Lead pump failure to start. 2) Lag pump failure to start.
11. Variable frequency drive control:
    a. When pump is operating, VFD modulates motor speed to maintain piping system differential pressure.
       1) Locate low pressure sensor at expansion tank connection to heating piping.

2) Locate high pressure signal in HWS piping located at upper level catwalk, above the First Aid Room.
3) Maintain a pressure differential of 5 psi.

b. With both pumps operating, synchronize the VFD's to deliver the same output frequency.

C. Chilled Water Pumps (P-_, P-_)
1. Inputs: Summer/Winter mode, pump operating status.
2. Devices: Software setting, software query, current sensor on each pump.
3. Sequences:
a. One pump operates to satisfy light load requirements (Lead pump).
b. Last pump to start is designated as Lead pump following pump shut-down.
c. Activate Lag pump upon failure of Lead pump.
d. Lead pump starts when:
1) System is in Summer mode, and
2) Economizer control cannot attain AHU-1 SAT setting.
e. Lead pump stops when:
1) System is in Winter mode or
2) Outside air temperature is below 55F (adjustable).
f. Lag pump starts when lead pump is operating above 55 Hz and OAT is above 80F (adjustable). Pumps operate in parallel.
g. Lag pump stops when VFD output drops below 25 Hz for parallel pump operation.
4. Variable frequency drive control:
a. When pump is operating, VFD modulates motor speed to maintain piping system differential pressure.
1) Locate low pressure sensor at expansion tank connection to chilled water piping.
2) Locate high pressure signal in CHS piping located at AHU-1 control valve.
3) Maintain a pressure differential of 15 psi.
b. With both pumps operating, synchronize the VFD's to deliver the same output frequency.
5. Current sensor establishes pump status for each pump.
6. Annunciate Lead pump selection on cooling system display of operator interface.
7. Alarms:
a. Lead Pump Failure – upon failure to start.
b. Lag Pump Failure – upon failure to start.

D. Core Water Pumps (P-_, P-_)
1. One pump operates to satisfy flow requirements (Lead pump).
2. Last pump to start is designated as Lead Pump following pump shut-down.
3. Activate Standby pump upon failure of Lead pump.
4. Lead pump starts when system a heat pump activates in unoccupied mode or a zone served by a heat pump enters start-up mode.
5. Pump stops when all heat pumps are in unoccupied mode and zones are not calling for heating.

E. In-Floor Heating Loop Pump (P-_)
1. Input: Outside air temperature.
2. Pump operates continuously when outside air temperature is below 50F.
3. Current sensor on pump motor wiring annunciates status at operator interface.
4. Alarm: Pump off.
5. Discrete Conditions: Pump is disabled in Summer mode.

F. Dehumidification Unit Heating Coil Pump (P-_)
   1. Pump operates on signal from Dehumidification air handling unit.
   2. Current sensor on pump motor wiring annunciates status at operator interface.
   3. Alarm: Pump off when outside air temperature is below 35 degrees F.

G. AHU Coil Pump (P-_)
   1. Pump turns on when outdoor air temperature drops below 35 degrees F.
   2. Pump turns off when outdoor air temperature rises above 40 degrees F.
   3. Current sensor on pump motor wiring annunciates status at operator interface.
   4. Alarm:
      a. Pump off when outside air temperature is below 33 degrees F.
      b. Pump on when outside air temperature is above 42 degrees F.

H. AHU Coil Pump (P-_)
   1. Pump turns on when outdoor air temperature drops below 35 degrees F.
   2. Pump turns off when outdoor air temperature rises above 40 degrees F.
   3. Current sensor on pump motor wiring annunciates status at operator interface.
   4. Alarm:
      a. Pump off when outside air temperature is below 33 degrees F.
      b. Pump on when outside air temperature is above 42 degrees F.

3.06 CONTROL DAMPER SEQUENCES

A. Control Dampers:

B. Combustion Air Damper for Water Heater:
   1. Inputs: Call for heat from water heater controller.
   2. Devices:
      a. Normally open combustion air damper with end switch.
      b. Outside air temperature sensor.
      c. Combustion air damper actuator.
   3. Sequence:
      a. Combustion air damper closes when outside air temperature is below 40 degrees F.
      b. Upon a call for water heater burner operation, open combustion air damper.
      c. End switch proves damper position suitable for burner operation and transmits signal to operate to burner.

C. Arena ventilation damper serving AHU-1:
   1. Input: CO2 concentration of arena air. Threshold setting: 1200 ppm CO2.
   2. Devices: CO2 sensor in return air stream. Supply air duct motor operated damper.
   3. Sequence:
      a. Open damper when CO2 concentration exceeds threshold setting.
         1) Damper open position determined by air balancing measurements.
         2) May not be 100 percent open.
      b. Change AHU Fan operation from low speed to high speed.

3.07 HVAC FANS:

A. Toilet Exhaust Fan (F-_):
   1. Fan starts and motor operated damper opens when lobby is in occupied mode.
   2. Fan stops and motor operated damper closes when lobby is in unoccupied mode.

3. Monitor operation with current sensor on fan motor wiring.
4. Annunciate operation at airflow system display of operator interface.
5. Alarm: Fan off and Lobby in occupied mode.

B. Team Room Exhaust Fan (F-_):
1. Fan starts and motor operated damper opens when any team room is in occupied mode.
2. Fan stops and motor operated damper closes when all team rooms are in unoccupied mode.
3. Monitor operation with current sensor on fan motor wiring.
4. Annunciate operation at airflow system display of operator interface.

C. Recycling Area Exhaust Fan (F-_):
1. Fan operates continuously, through local fan speed controller and local On-Off switch.
2. Manual speed controller allows adjustment of fan speed to suit local odor conditions.
3. Normally closed motor operated dampers at intake and relief air louvers remain open during fan operation.
4. Spring return actuators close dampers at intake and relief louvers upon fan deactivation. DDC system monitors fan operation through current sensor on fan wiring and monitors damper positions through end switches installed at each damper.

D. Grease Hood Exhaust Fan (F-_):
1. Fan operates continuously.
2. VFD operates fan at full speed when local switch on hood is activated.
3. VFD operates fan at 20 Hz when local switch on hood is deactivated.
4. Monitor operation with current sensor on fan motor wiring.
5. Annunciate operation at airflow system display of operator interface.
6. Alarms:
   a. Low speed operation when hood switch is on.
   b. High speed operation when hood switch is off.

E. Concessions Exhaust Fan (F-_):
1. Fan starts and motor operated damper opens when skate sharpening or concessions zone is in occupied mode.
2. Fan stops and motor operated damper closes when skate sharpening and concessions zones are in unoccupied mode.
3. Monitor operation with current sensor on fan motor wiring.
4. Annunciate operation at airflow system display of operator interface.

F. Electrical room Exhaust Fan (F-9):
1. 24 volt thermostat activates fan when zone temperature exceeds thermostat setting.
2. No DDC control or monitoring.

G. Refrigeration Equipment Exhaust Fan (F-_):
1. Fan operates continuously.
2. Monitor fan performance with differential pressure sensor located across the inlet and outlet of the fan.
3. Annunciate operation at airflow system display of operator interface.
4. Alarm: Fan off.

H. Refrigeration Equipment Safety Exhaust Fan (F-_):
1. Ammonia detector monitors room air for leaks. Refer to Section 13 18 00 for Refrigerant Monitoring System specification.

2. Signal from monitoring system activates fan.
3. Monitor operation with current sensor on fan motor wiring.
4. Annunciate operation at airflow system display of operator interface.
5. Alarm: Fan on. Notice to evacuate building through the front lobby.

I. Ice Resurfacer Exhaust Fan (F-_):
1. Fan starts and motor operated damper opens when arena zone is in occupied mode.
2. Provide manual on-off switch near battery chargers.
3. Fan stops and motor operated damper closes when arena zone is in unoccupied mode.
4. Monitor operation with current sensor on fan motor wiring.
5. Annunciate operation at airflow system display of operator interface.
6. Alarm: Fan off and arena is in occupied mode.

J. Arena Exhaust Fan (F-_ and F-_):
1. Arena air quality monitor measures concentration of CO2 and NOx.
2. Upon sensing contaminants above the low level threshold, a signal (contact closure) is generated from the monitoring system.
3. Fan F-_ starts and associated motor operated damper opens when low or high level signal is received by the DDC system.
4. Fan F-_ stops and the associated motorized damper closes when the low level signal has been off for an adjustable time period (five minutes).
5. Monitor F-_ operation with current sensor on fan motor wiring.
6. Annunciate F-_ operation at airflow system display of operator interface.
7. Upon sensing contaminants above the high level threshold, a signal (contact closure) is generated from the monitoring system.
8. Fan F-_ starts and associated motor operated damper opens when high level signal is received by the DDC system.
9. Fan F-_ stops and the associated motorized damper closes when the low level signal has been off for an adjustable time period (five minutes).
10. Monitor F-_ operation with current sensor on fan motor wiring.
11. Annunciate F-_ operation at airflow system display of operator interface.
12. Alarms:
    a. Fan F-_ off and low level signal from the air quality monitor is active.
    b. Fan F-_ off and high level signal from the air quality monitor is active.

K. Team Room Supply Fan (F-_):
1. Operates in conjunction with fan F-_.
2. Alarm: Fan failure via current sensor when F-_ is called to operate.

3.08 VAV TERMINALS

A. Inputs:
1. Zone Temperature.
2. [Associated finned tube radiation control valve position (for selected VAV zones).]

B. Input devices
1. Wall mounted zone temperature sensor [with warmer, cooler local setting].
2. Total pressure and static pressure sensors provided with the VAV terminals.

C. Software inputs
1. Occupied mode zone temperature setting.
2. Unoccupied mode zone temperature setting.

3. Associated finned tube radiation control valve position (where applicable).

D. Sequences:
   1. Mode Sequences:
      a. Daily scheduling initiates morning warm-up for VAV zones; bring zones to occupied temperature setting.
   2. Ventilation control sequences:
      a. VAV damper is at or above minimum airflow position (AHU operating or not).
   3. Temperature control sequences:
      a. Damper modulates open (to scheduled maximum) to offset increases in zone temperature above zone temperature setting.
      b. Damper modulates closed (limited by scheduled minimum airflow) to reduce cooling airflow and maintain zone at zone temperature setting.
      c. Damper modulates open (to scheduled heating maximum) if zone temperature remains below temperature setting and heating valve(s) are fully open.

E. VAV Heating Coil Control Valve
   1. Sequences:
      a. With VAV damper modulated to minimum position, and zone temperature below temperature setting, modulate valve open through P-I loop to attain zone temperature setting.
   2. Discrete Conditions:
      a. For zones with radiation:
         1) Modulate radiation control valve open on a call for heat first.
         2) Modulate the heating coil control valve open only when radiation valve position is above threshold (90% open).

3.09 VAV TERMINALS

A. Inputs:
   1. Zone Temperature.
   2. [Local control signal (warmer, cooler).]
   3. [Occupancy / vacancy signal.]
   4. [Carbon dioxide concentration (ppm).]
   5. [Associated finned tube radiation control valve position (for selected VAV zones).]
   6. [Supply air temperature.]
   7. Airflow rate of each VAV terminal.

B. Input devices
   1. Wall mounted zone temperature sensor [with warmer, cooler local setting].
   2. [Occupancy signal, controlling zone lights.]
   3. [Zone carbon dioxide sensor, mounted in RA duct or wall mounted in the zone.]
   4. [Duct temperature sensor (located downstream of VAV heating coil, mid-height).]
   5. Total pressure and static pressure sensors provided with the VAV terminals.

C. Software inputs
   1. Occupied mode zone temperature setting.
   2. Unoccupied mode zone temperature setting.
   3. Associated finned tube radiation control valve position (where applicable).
   4. [Heating mode upper temperature limit.]

D. Sequences:
   1. Mode Sequences:

a. Daily scheduling initiates morning warm-up for VAV zones; bring zones to occupied temperature setting.
b. Monitor occupied condition through occupancy sensor for selected zones.
c. Vacancy signal will put VAV zone in unoccupied mode following 20 minute vacancy period.
d. Occupied mode will be initiated upon signal from occupancy sensor.

2. Ventilation control sequences:
   a. VAV damper is 10% open when zone is unoccupied.
   b. Upon detection of occupants, VAV damper opens to scheduled minimum airflow.
   c. [Damper modulates open to maintain carbon dioxide levels below CO2 setting.]
3. Temperature control sequences:
   a. Damper modulates open (up to scheduled maximum) to offset increases in zone temperature above zone temperature setting.
   b. Damper modulates closed (limited by scheduled minimum airflow) to reduce cooling airflow and maintain zone at zone temperature setting.
   c. Damper modulates open (to scheduled heating maximum) if zone temperature remains below temperature setting and heating valve(s) are fully open.

E. Heating Coil Control Valve
1. Sequences:
   a. With VAV damper modulated to minimum position, and zone temperature below temperature setting, modulate valve open through P-I loop to attain zone temperature setting.
   b. [Open heating valve to provide supply air temperature scheduled on the VAV Terminal Schedule.]
2. Discrete Conditions:
   a. For zones with radiation:
      1) Modulate radiation control valve open on a call for heat first.
      2) Modulate the heating coil control valve open only when radiation valve position is above threshold (90% open).

3.10 VAV TERMINALS

A. Inputs:
1. Zone Temperature.
2. [Local control signal (warmer, cooler).]
3. [Occupancy / vacancy signal.]
4. [Carbon dioxide concentration (ppm).]
5. [Associated finned tube radiation control valve position (for selected VAV zones).]
6. [Supply air temperature.]
7. Airflow rate of each VAV terminal.
8. Mode Sequences:
   a. Daily scheduling initiates morning warm-up for VAV zones; bring zones to occupied temperature setting.
   b. Monitor occupied condition through occupancy sensor for selected zones.
   c. Vacancy signal will put VAV zone in unoccupied mode following 20 minute vacancy period.
   d. Occupied mode will be initiated upon signal from occupancy sensor.

B. Input devices
1. Wall mounted zone temperature sensor [with warmer, cooler local setting].
2. [Occupancy signal, controlling zone lights.]

3. [Zone carbon dioxide sensor, mounted in RA duct or wall mounted in the zone.]
4. [Duct temperature sensor (located downstream of VAV heating coil, mid-height).]
5. Total pressure and static pressure sensors provided with the VAV terminals.

C. Software inputs
1. Occupied mode zone temperature setting.
2. Unoccupied mode zone temperature setting.
3. Associated finned tube radiation control valve position (where applicable).
4. [Heating mode upper temperature limit.]

D. Sequences:
1. Mode Sequences:
a. Daily scheduling initiates morning warm-up for VAV zones; bring zones to occupied temperature setting.
b. Monitor occupied condition through occupancy sensor for selected zones.
c. Vacancy signal will put VAV zone in unoccupied mode following 20 minute vacancy period.
d. Occupied mode will be initiated upon signal from occupancy sensor.
2. Ventilation control sequences:
a. VAV damper is 10% open when zone is unoccupied.
b. Upon detection of occupants, VAV damper opens to scheduled minimum airflow.
c. [Damper modulates open to maintain carbon dioxide levels below CO2 setting.]
3. Temperature control sequences:
a. Damper modulates open (up to scheduled maximum) to offset increases in zone temperature above zone temperature setting.
b. Damper modulates closed (limited by schedule minimum airflow) to reduce cooling airflow and maintain zone at zone temperature setting.

E. Heating Coil Control Valve
1. Sequences:
a. With VAV damper modulated to minimum position, and zone temperature below temperature setting, modulate valve open through P-I loop to attain zone temperature setting.
b. [Open heating valve to provide supply air temperature scheduled on the VAV Terminal Schedule.]
2. Discrete Conditions:
a. For zones with radiation, modulate radiation control valve open on a call for heat first. Modulate the heating coil control valve open only when radiation valve position is above threshold (90% open).
b. When VAV damper has modulated to minimum position, and zone temperature is below temperature setting, modulate valve open through P-I loop to attain zone temperature setting.

3.11 HVAC GRAVITY VENTILATORS

3.12 VENTILATION HOODS

3.13 BOILERS (REFER TO SECTION 23 52 00 FOR INTEGRAL CONTROLS)

A. Boiler control programming is integral to factory furnished controls.
1. Controls include a 0-10VDC input for boiler modulation rate or setpoint.
2. Enable/disable.
3. 0-10VDC variable flow signal to control variable speed pumps.

B. DDC system monitoring includes the following points:
   1. 0-10VDC output of modulation rate.
   2. Auxiliary Relay.
   3. Auxiliary Proving Switch.
   4. Alarm Contacts.
   5. Runtime Contacts.
   6. Manual Reset Low Water Cutoff.
   7. Flow Switch.
   8. High and Low Gas Pressure Switches.
   9. Tank Thermostat.
   10. Three Wall Thermostat/Zone Controls.
   11. System Supply Sensor.
   12. Outdoor Sensor.
   13. Building Management System Signal.
   14. Modbus Control Contacts.
   15. Cascade Control Circuit.

C. BOILER SUPPLY WATER TEMPERATURE
   1. Heating Water Supply (HWS) Temperature Setting - Outdoor Reset
      a. Inputs:
         1) Outdoor air temperature.
         2) Heating Water Return (HWR) Temperature.
      b. Device: Outdoor air temperature sensor (sun shielded)
      c. Sequences:
         1) For outdoor temperatures below -20 degrees F, maintain 140 degrees F supply water temperature.
         2) For outdoor temperatures between -20 degrees F and 40 degrees F, decrease the water temperature setting 1 degrees F for every 2 degrees F above -20 degrees F ambient temperature. Modulate boiler burners and sequence boilers to maintain setting.
         3) For outdoor temperatures above 40 degrees F, modulate boiler output to maintain return water temperature (HWR) setting of 100 degrees F.

3.14 FURNACES

A. Thermostat has fan switch with On and Auto settings:
   1. With the switch in the On position, furnace blower operates continuously, at the cooling airflow setting.
   2. With the switch in the Auto position, furnace blower only operates in conjunction with call for heating or cooling as described below.

B. Thermostat has Heat-Off-Cool switch:
   1. Subbase switch in Heat position: (fan in Auto mode):
      a. Thermostat below temperature setting activates burner.
      b. Plenum temperature sensor activates furnace blower at heating fan speed upon reaching temperature setting.
      c. Thermostat sensing temperature above temperature setting deactivates burner.
      d. Furnace blower is deactivated when plenum temperature falls below temperature setting.
   2. Subbase switch in Off position: System is disabled.
   3. Subbase switch in Cool position: (fan in Auto mode):

a. Thermostat above temperature setting activates air cooled condensing unit and furnace blower (at cooling fan speed).
b. Thermostat sensing temperature below setting deactivates condensing unit.
c. Time delay continues fan operation for an additional five minutes following the deactivation of the condensing unit.
d. Furnace blower is deactivated following the timed countdown of the run-timer.

3.15 FUEL FIRED HEATERS

A. Low-Intensity Radiant Tube Heaters
1. Zone temperature sensors provide input to DDC system.
2. DDC system signals individual burner operation based on zone temperatures.
3. Activate associated burner when zone sensor detects temperatures below setting.
4. Temperature Settings: Occupied: 60 degrees F, Unoccupied 40 degrees F.

3.16 AIR COOLED CONDENSING UNITS

A. Inputs: Outside air temperature, zone temperature.

B. Software inputs: Zone temperature setting, AHU-1 status, Occupied mode status.

C. Devices: Outside air temperature sensor, current sensor on AHU-1 fan motor, zone temperature sensor.

D. Sequence:
1. Activate unit when zone temperature exceeds zone temperature setting.
2. Deactivate when zone temperature drops 1 degree below zone temperature setting.

E. Discrete conditions required for activation:
1. Outside air temperature is above 65 degrees F.
2. AHU-1 is operating.
3. System is in Occupied mode.

3.17 AIR COOLED CONDENSING UNIT FOR DEHUMIDIFICATION

A. Inputs: Outside air dewpoint, AHU-1 status.

B. Devices: Outside air dewpoint sensor, current sensor on AHU-1 fan motor.

C. Sequence:
1. Activate unit when outside air dewpoint exceeds 65F and AHU-1 is operating.
2. Deactivate when dewpoint drops below 63F or AHU-1 shuts off.

3.18 CHILLER

3.19 COOLING TOWER

3.20 EVAPORATIVE FLUID COOLER

A. Inputs: Building season mode, Core water supply temperature.

B. System is inactive in winter mode. Normally open sump drain valve is open.

C. In summer mode, sump drain valve is closed.

D. Upon activation from the operator interface, cold water solenoid valve located within the heated building envelope is opened, allowing float valve to fill the sump.

E. Sequences:
   1. For core water supply temperatures above 85F, open control valve to flow water through the evaporative cooler coil and activate one evaporative cooler fan.
   2. For core water supply temperatures above 87 degrees F activate the second fan.
   3. For core water supply temperatures above 90 degrees F, activate fluid cooler spray pump.
   4. Disable spray pump when supply water temperature falls below 87 degrees F.
   5. Disable fan 2 when supply water temperature falls below 85 degrees F.
   6. Disable fan 1 when supply water temperature falls below 83 degrees F.

3.21 HEAT WHEEL

A. Inputs: Outside air (O.A.) dewpoint, O.A. temperature. AHU-2 status.

B. Devices: O.A. dewpoint sensor, O.A. temperature sensor, AHU-2 supply fan motor current sensor.

C. Sequences:
   1. Activate heat wheel when AHU-2 is on and O.A. dewpoint is above 60 degrees F.
   2. Activate heat wheel when AHU-2 is on and O.A. temperature is below 30 degrees F.

3.22 FIXED-PLATE ENERGY RECOVERY EQUIPMENT

A. Bypass damper (fresh air).

B. Bypass Damper (exhaust air).

3.23 PACKAGED AIR-TO-AIR ENERGY RECOVERY DEVICES

A. Heat wheel rotation motor.
   1. Start/Stop.
   2. Modulation.

B. Bypass Damper (fresh air).

C. Bypass Damper (exhaust air).

3.24 AIR HANDLING UNITS

A. Control Modes:
   1. Night Setback / Setup
      a. Inputs:
         1) Operational Schedule for heat pump zones and ice arena.
         2) Supply duct temperature(s) associated with the supply unit.
      b. Devices:
         1) Supply duct temperature sensor associated with the supply unit.
      c. Sequences:
         1) Upon attaining unoccupied mode, close the outside air damper.

2) Deactivate unit supply fan, heating and refrigeration systems.
3) Open outside air damper and activate fan if associated heat pump zone mode changes to occupied.

2. Morning Warm-up/Cool-down
   a. Inputs:
   b. Devices:
   c. Sequence:

B. Activation/Deactivation
1. Inputs:
   a. Heat pump zone mode (occupied/unoccupied).
   b. Team room zone mode (occupied/Unoccupied).
   c. Building operational schedule.
   d. Freezestat, fire alarm signal.
   e. Dehumidification Unit operational status.
2. Devices:
   a. Software point. Create occupancy mode schedules for each heat pump.
   b. Dehumidification Unit control panel fan status output.
3. Enable conditions:
   a. Associated heat pump zone is in occupied mode; or
   b. Team room is in occupied mode and Dehumidification unit is off.
4. Enable sequence:
   a. Open outside air damper.
   b. Close supply fan motor contactors.
   c. Enable unit power exhaust fan.
5. Disable sequence:
   a. Open supply fan motor contactors.
   b. Close outside air damper.
   c. Disable power exhaust fan.
   d. Disable associated exhaust fans.

C. Low Supply Air Temperature (freezestat)
1. Input: Freezestat temperature signal.
2. Device: binary, two position switch on serpentine element temperature sensor.
3. Sequence: disables AHU upon sensing cold temperature.
4. Control setting: 35 degrees F.
5. Alarm: “AHU freezestat!” upon activation.

D. Duct Smoke Detector Shutdown
1. Input: smoke detector signal.
2. Device: binary, auxiliary contact on smoke detectors.
3. Sequence: Disables AHU by opening fan motor contacts upon sensing smoke.
4. Control setting: Factory set by smoke detector.
5. Alarm: “Smoke Detector Shutdown!” upon activation.

E. AHU-1 Supply Air Temperature Setting
1. Inputs: Outside air temperature.
2. Devices:
   a. Heating coil control valve.
   b. Heat wheel motor contactor.
   c. DX air cooled condensing unit compressor contactor.
   d. Return air duct humidity sensor.

3. Sequence:
    a. modulate hot water heating valve to maintain minimum supply air temperature of 55 degrees F.
    b. Reset supply air temperature to maintain return air humidity level below setting.
        1) Increase temperature
    c. result in VAV dampers
4. Discrete Conditions: AHU-1 supply fan is operating.

F. AHU-2 Supply Air Temperature Setting
1. Inputs: Outside air temperature.
2. Devices: Heating coil control valve,
3. Sequence:
    a. modulate hot water heating valve to maintain minimum supply air temperature of 55 degrees F to heat pumps.
    b. Close valve to coil when O.A. temperature is above 55 degrees F.
    c. Activate condensing unit to dehumidify ventilation air when O.A. dewpoint exceeds setting. Supply temperature is not controlled during this sequence.
4. Discrete Conditions: AHU-2 supply fan motor is operating.

G. AHU-3 Supply Air Temperature Setting
1. Inputs:
    a. Binary call for heat.
    b. Binary call for cooling.
    c. Mixed air temperature.
    d. Supply air temperature.
2. Devices:
    a. Zone thermostat (manual changeover heating/cooling).
    b. Heating coil face damper actuator.
    c. DX air cooled condensing unit.
    d. Supply duct temperature sensor.
3. Sequence:
    a. For thermostat switch in Cool position:
        1) Heating coil is manually closed off using isolation valves for summer operation.
        2) Face and bypass damper is set to full face airflow (normal) for summer operation.
        3) For thermostat call for cooling (sequential steps):
            a) Decrease outside air to minimum airflow position (10 percent open).
            b) Activate DX condensing unit (single stage cooling).
            c) Supply air temperature below 50 degrees deactivates DX cooling.
        4) For thermostat in dead-band (no heating or cooling required):
            a) Maintain mixed air dampers at current position.
            b) Disable DX condensing unit.
        5) For thermostat call for heating:
            a) Modulate outside air dampers open to increase mixed air temperature.
    b. For thermostat switch in Heat position:
        1) Position mixed air dampers to minimum ventilation position (10 percent).
        2) Heating coil flow: Manually controlled by opening isolation valves.
        3) Face and bypass damper is set to full face airflow (normal) for winter operation.
        4) For thermostat call for heating:
            a) Maintain dampers in full flow through coil face area (zero bypass air).
        5) For thermostat in dead-band (no heating or cooling required):
            a) Maintain mixed air dampers at current position.

b) Maintain face and bypass dampers at current position.
6) For thermostat call for cooling (sequential steps):
a) Modulate face damper to full bypass position.
b) Modulate mixed air dampers to increase outside air percentage.
c. Discrete Conditions:
1) AHU-3 supply fan motor is operating.
2) DX condensing unit disabled when thermostat switched to Heat position.
3) Face and bypass dampers disabled when thermostat switched to Cool position.

H. Outside Air Damper
1. Inputs: Damper Position (percent open).
2. Devices: Modulating damper actuator.
3. Sequence:
a. When unit is activated, position damper to balanced airflow position as established by balancing contractor.
b. Close damper when unit is deactivated.

I. VAV Supply fan speed control
1. Inputs:
2. Devices:
3. Sequence:

J. VAV return fan speed control
1. Inputs:
2. Devices:
3. Sequence:

K. Power Exhaust Fan
1. Refer to EF-2 sequence described above.

L. Other Air Handling Unit Controls
Provide monitoring and display of points as follows:
1. Filter Monitor
a. Inputs:
1) Differential pressure across filter bank.
b. Discrete Conditions:
1) AHU is operating.
2) 1 minute time delay upon unit start-up.
c. Analog Limits:
1) Differential pressure is below 0.10 inch w.c.
2) Differential pressure is above 1.0 inch w.c.
d. Alarms:
1) “Missing Filters” alarm if differential pressure is below 0.10 inch w.c.
2) “Dirty Filters” alarm if differential pressure is above 1.0 inch w.c.
2. humidity
a. Inputs:
1) System rh.
2) System rh setting.
b. Devices:
1) Relative humidity sensor.
c. Sequences:

1) When the rh exceeds the rh setting, activate air cooled condensing unit.
2) When the rh is 3 percent below the rh setting disable condensing unit.

d. Discrete Conditions:
1) Disable DX cooling when AHU-2 is off.
2) Disable DX cooling when O.A. temperature is below 50 degrees F.

e. Desired result:
1) Zone rh is maintained at or below 60 percent with a 55% rh setting.

3.25 INDOOR GAS FIRED HEATING AND VENTILATING AIR HANDLING UNIT

A. Supply Fan

B. Gas burner

C. Outside air dampers

D. Return air dampers

3.26 DUCT HEATING COILS

A. Zone Heating Control Valve (typical for duct heating coils and VAV reheat coils)
1. Input: Zone temperature.
2. Device: Zone temperature sensor.
3. Sequence: Maintain zone temperature by modulating valve through P-I control loop.
4. Throttling range: 4 degrees; 100 percent open at 2 degrees below setting.
5. Discrete Conditions: Disable alarm in start-up mode.
6. Alarm: “Low Zone Temp.!” for zone temperature 3 degrees below temperature setting.

3.27 FINNED TUBE RADIANT HEATERS

A. Refer to CONTROL VALVE SEQUENCES article.

3.28 UNIT HEATERS AND CABINET UNIT HEATERS

A. Unit Heater Fan Motor
1. Input: Zone temperature.
2. Sequence:
a. Operate fan through relay when temperature sensor is below zone temperature setting.

B. Unit Heater Control Valve
1. Input: Outside air temperature, zone temperature.
2. Device: O.A. temperature sensor (shielded), zone temperature sensor.
3. Sequence: Modulate valve thru P-I loop to maintain zone temperature setting of 65 degrees F.
4. Discrete Condition: Hold valve closed when O.A. temperatures exceed 60 degrees F.

C. Cabinet Unit Heater Fan Motor
1. Input: Zone temperature.
2. Devices: Zone temperature sensor, freezestat (BI).
3. Sequence:

a. Operate fan through relay when temperature sensor is below zone temperature setting.
b. Disable fan through freezestat if coil LAT is less than 35 degrees F.

4. Alarm: "<Unit Tag> Freezestat!" for open contacts on freezestat control.

D. Cabinet Unit Heater Control Valve
1. Input: Outside air temperature, zone temperature.
2. Device: O.A. temperature sensor (shielded), zone temperature sensor.
3. Sequence: Modulate valve thru P-I loop to maintain zone temperature setting of 65 degrees F.
4. Discrete Condition: Hold valve closed when O.A. temperatures exceed 60 degrees F.

3.29 RADIANT CEILING PANELS

A. Zone Heating Control Valve (typical for duct heating coils and VAV reheat coils)
1. Input: Zone temperature.
2. Device: Zone temperature sensor.
3. Sequence: Maintain zone temperature by modulating valve through P-I control loop.
a. Throttling range: 4 degrees; 100 percent open at 2 degrees below setting.
b. Discrete Conditions: Disable alarm in start-up mode.
c. Alarm: "Low Zone Temp.!" for zone temperature 3 degrees below temperature setting.

3.30 AIR CURTAINS

A. Fan motor:
1. Inputs: Arena occupancy mode.
2. Devices: Software scheduling point.
3. Sequence: Activate fan when arena is in occupied mode.
4. Discrete Conditions: "Enable Air Curtains" input from user interface.

B. Heating coil valve:
1. Inputs: local rheostat controls valve position through DDC system.
2. Sequence: Warmer - Colder settings on rheostat determine % open for hot water coil.
3. Discrete conditions: Operator interface can program controllable range.

3.31 DEHUMIDIFICATION UNIT

A. This unit is provided with operating controls. Monitor control point output from integral control panel.

3.32 DESICCANT DEHUMIDIFICATION UNIT

A. This unit is provided with operating controls. Monitor control point output from integral control panel.

END OF SECTION

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SECTION 23 11 23

FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Natural gas piping above grade.
   2. Natural gas piping below grade.
   3. Unions and flanges.
   4. Valves.
   5. Pipe hangers and supports.
   6. Natural gas pressure regulators.

B. Related Sections:
   1. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
   2. Section 08 31 13 - Access Doors and Frames: Access doors for concealed valves and accessories.
   3. Section 09 91 00 - Painting and Coating: Product requirements for painting for placement by this section.
   4. Section 23 05 03 - Pipes and Tubes for HVAC Piping and Equipment: Piping materials for gas piping systems.
   5. Section 23 05 23 - General-Duty Valves for HVAC Piping: Valves for gas piping systems.
   6. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports [and firestopping] for placement by this section.
   7. Section 23 05 53 - Identification for Mechanical Piping and Equipment: Product requirements for valve and pipe identification for placement by this section.

1.02 REFERENCES

A. American National Standards Institute (ANSI):
   1. Z21.15 - Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.

B. American Society of Mechanical Engineers (ASME):
   1. B16.3 - Malleable Iron Threaded Fittings.
   2. B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
   3. B16.33 - Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 125 psig (sizes 1/2 - 2).
   4. B16.44 - Manually Operated Metallic Gas Valves for Use in Above Ground Piping Systems Up to 5 psig (sizes 1/2 - 2).
   5. B31.9 - Building Services Piping.

C. ASTM International (ASTM):
   1. A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

2. A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
3. B88 - Standard Specification for Seamless Copper Water Tube.

D. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:
1. SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. SP 69 - Pipe Hangers and Supports - Selection and Application.
3. SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

E. National Fire Protection Association (NFPA):
1. 54 - National Fuel Gas Code.

1.03 SYSTEM DESCRIPTION

A. Where more than 1 piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.

B. Provide pipe hangers and supports in accordance with ASTM F708, MSS SP 58, MSS SP 69, and MSS SP 89 and State of Minnesota Standards.

C. Use plug, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

1.04 SUBMITTALS

A. Section 01 33 00: Submittal procedures.

B. Product Data:
1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
4. Piping Specialties: Submit manufacturers catalog information including capacity, rough-in requirements, and service sizes for the following:
a. Natural gas pressure regulators.

1.05 CLOSEOUT SUBMITTALS

A. See Section 01 70 00.

B. Project Record Documents: Record actual locations of valves, piping system, and system components.

C. Operation and Maintenance Data: Submit for valves and gas pressure regulators installation instructions, spare parts lists, and exploded assembly views.

1.06 QUALITY ASSURANCE

A. Perform natural gas work in accordance with NFPA 54.

B. Perform Work in accordance with applicable code and local gas company requirements.

C. Perform Work in accordance with authority having jurisdiction for support attachments to building structure.

D. Furnish shutoff valves complying with ASME B16.33 or ANSI Z21.15.

E. Perform Work in accordance with State of Wisconsin standard.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 3 years experience.

B. Installer: Company specializing in performing Work of this Section with minimum 3 years experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 60 00.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation. Furnish temporary protective coating on cast iron and steel valves.

1.09 ENVIRONMENTAL REQUIREMENTS

A. See Section 01 60 00.

B. Do not install underground piping when bedding is wet or frozen.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.11 COORDINATION

A. See Section 01 30 00.

1.12 WARRANTY

A. See Section 01 70 00.

B. Furnish 5-year manufacturer warranty for valves, excluding packing.

1.13 EXTRA MATERIALS

A. See Section 01 70 00.

PART 2 PRODUCTS

2.01 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M, Type E, Grade B, Schedule 40 black:
   1. Fittings: ASTM A234/A234M forged steel welding type.
   2. Joints: ASME B31.9, welded.
   3. Jacket: AWWA C105 polyethylene jacket or double layer, half-lapped 10-mil polyethylene tape.

B. Polyethylene Pipe:
   1. Pipe: ASTM D 2513, SDR 11
   2. Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
   3. Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
   4. Anodeless Service-Line Risers: Factory fabricated and leak tested.
   5. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
      a. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering. Vent casing aboveground.
      b. Aboveground Portion: PE transition fitting.
      c. Outlet shall be threaded or flanged or suitable for welded connection.
      d. Tracer wire connection.
      e. Ultraviolet shield.
      f. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.02 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Type E, Grade B, Schedule 40 black:
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M forged steel welding type.
   2. Joints: Threaded for pipe 2 inches and smaller.
   3. Joints: Welded for pipe 2-1/2 inches and larger.
   4. Galvanized pipe not allowed.

2.03 REGULATOR VENT PIPING, ABOVE GRADE

A. Indoors: Sch. 40 steel pipe and fittings

B. Outdoors: PVC pipe, tubing, and fittings, UL 651.

2.04 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
   1. Galvanized Steel Piping: Screwed galvanized malleable iron ground joint union, brass iron seat.
   2. Black Steel Piping: Class 150, screwed malleable black iron ground union, brass to iron seat.

2.05 BALL VALVES

A. Manufacturers:
   1. Apollo.
   2. Crane Valve, North America.
   3. Hammond Valve.
   4. Kitz.
   5. Milwaukee Valve Company.
   6. Nibco, Inc.
   7. Stockham Valves & Fittings.
   8. Watts.

B. Upstream of meter: Furnish shutoff valves complying with ASME B16.33.

C. Inside building: Furnish shutoff valves complying with ASME B16.44 or ANSI Z21.15.

2.06 PLUG VALVES

A. Manufacturers:
   1. Flow Control Equipment, Inc.
   2. Homestead Valve.
   3. Milliken.

B. Upstream of meter: Furnish shutoff valves complying with ASME B16.33.

C. Inside building: Furnish shutoff valves complying with ASME B16.44 or ANSI Z21.15.

2.07 NATURAL GAS PRESSURE REGULATORS

A. Manufacturers:
   1. Fischer.
   2. Maxitrol.

B. Product Description: Spring loaded, general purpose, self-operating service regulator including internal relief type diaphragm assembly and vent valve. Diaphragm case can be rotated 360 degrees in relation to body:
   1. Comply with ANSI Z21.80.
   2. Temperatures: Minus 20 degrees F to 150 degrees F.
   3. Body: Steel casting.
   4. Spring case, lower diaphragm casing, union ring, seat ring and disk holder: Aluminum.
   5. Disk, diaphragm, and O-Ring: Nitrile.
   6. Maximum Inlet Pressure: 150 psig.
   7. Furnish sizes 2 inches and smaller with threaded ends.

2.08 FLEXIBLE APPLIANCE CONNECTORS

A. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.

B. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.

C. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.

D. Corrugated stainless-steel tubing with polymer coating.

E. Operating-Pressure Rating: 0.5 psig (14 inch wc).

F. End Fittings: Zinc-coated steel.

G. Threaded Ends: Comply with ASME B1.20.1.

H. Maximum Length: 72 inches

2.09 HANGERS AND SUPPORTS

A. See Section 23 05 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. See Section 01 30 00.

B. Verify 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 - UNDERGROUND PIPING SYSTEMS

A. Install natural gas piping in accordance with NFPA 54 and IFGC.

B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

C. Install underground, PE, natural-gas piping according to ASTM D 2774.

D. Steel Piping with Protective Coating:
   1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
   2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
   3. Replace pipe having damaged PE coating with new pipe.

3.04 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

A. Install natural gas piping in accordance with NFPA 54.

B. Refer to Section 23 05 00 for general pipe installation requirements.

C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

D. Install gas pressure regulator with independent vent full size opening on regulator and terminate outdoors.

E. Install gas piping to provide sufficient gas to supply maximum appliance demand at pressure higher than appliance minimum inlet pressure.

F. Provide connection to new gas service. Make all arrangements with Gas Utility for installation of new gas meter and service to building. Gas service distribution piping to have initial minimum pressure of 2 psi. Provide regulators on each branch serving appliances designed for lower inlet pressures.

3.05 PAINTING

A. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

B. Refer to Section 09 91 00.

C. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint.
   1. Finish Coat Material: Exterior/Interior, flat, latex.
   2. Color: Final color as selected by Architect [interior Yellow interior, exterior Flat Black]. Vary first and second coats to allow visual inspection of the completed Work.

3.06 FIELD QUALITY CONTROL

A. Refer to Section 01 40 00.

B. Where gas appliance will be damaged by test pressure, disconnect appliance and cap piping during pressure test. Reconnect appliance after pressure test and leak test connection.

C. Where gas appliance is designed for operating pressures equal to or greater than piping test pressure, provide gas valve to isolate appliance or equipment from gas test pressure.

D. Pressure test natural gas piping in accordance with NFPA 54.

E. Inspect, test, and purge gas piping in accordance with applicable codes, local gas company requirements, and State of Minnesota standards.

F. Where new branch piping is extended from existing system, pressure test new branch piping only. Leak test joint between new and existing piping with noncorrosive leak detection fluid or other approved method.

G. When pressure tests do not meet specified requirements, remove defective work, replace, and retest.

H. Immediately after gas is applied to a new system, or a system has been restored after gas service interruption, check pipe for leakage.
   1. Where leakage is detected, shut off gas supply until necessary repairs are complete.

I. Do not place appliances in service until leak testing and repairs are complete.

END OF SECTION

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SECTION 23 23 00

REFRIGERANT PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Refrigerant piping.
   2. Unions, flanges, and couplings.
   3. Pipe hangers and supports.
   4. Refrigerant specialties.

B. Related Sections:
   1. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
   2. Section 23 05 00 – Common Work Results for HVAC: Product and installation requirements:
      a. Administrative requirements.
      b. Pipe hangers and supports, sleeves and accessories for placement by this section.
      c. General piping installation requirements.
      d. Pipe labeling and identification requirements.
   3. Section 23 05 00 - Identification for HVAC Piping and Equipment: Product requirements for pipe identification for placement by this section.
   4. Section 23 07 00 - HVAC Insulation: Product requirements for Piping Insulation for placement by this section.
   5. Section 23 62 00 - Packaged Compressor and Condenser Units: Connections to outdoor equipment.
   6. Section 23 73 00 - Indoor Central Station Air Handling Units: Connections to indoor equipment.
   7. Section 23 81 26 – Split-System Air-Conditioners: Connections to indoor and outdoor equipment.
   8. Division 26 – Electrical: Execution requirements for electric connections specified by this section.

1.02 REFERENCES

A. Air-Conditioning, Heating & Refrigeration Institute (AHRI):
   1. ANSI/AHRI Standard 495 – Standard for Performance Rating of Refrigerant Liquid Receivers.
   2. ANSI/AHRI 710 – Performance Rating of Liquid-Line Driers.
   3. 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter Dryers.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
   1. 15 - Safety Code for Mechanical Refrigeration.

C. American Society of Mechanical Engineers (ASME):
   1. B31.5 - Refrigeration Piping.

D. ASTM International (ASTM):
   1. B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

E. American Welding Society (AWS):
   1. A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
   2. D1.1 - Structural Welding Code - Steel.

F. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:
   1. SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
   2. SP 69 - Pipe Hangers and Supports - Selection and Application.
   3. SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

G. Underwriters Laboratories Inc. (UL):
   1. 429 - Electrically Operated Valves.

1.03 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.

B. Provide unions, or couplings at locations requiring servicing. Install unions or couplings downstream of valves and at equipment connections.

C. Provide pipe hangers and supports in accordance with ASME B31.5, ASTM F708, MSS SP 58, MSS SP 69, and MSS SP 89.

D. Flexible Connectors: Use at or near compressors where piping configuration does not absorb vibration.

1.04 SUBMITTALS

A. Product Data:
   1. Piping: Submit data on pipe materials, fittings, and accessories.
   2. Valves: manufacturers catalog data with valve data and ratings for each service.
   3. Refrigerant Specialties: Submit manufacturers catalog data including capacity, component sizes, rough-in requirements, and service sizes for the following:
      a. Refrigerant moisture and liquid indicators.
      b. Refrigerant filter-driers.
      c. Refrigerant expansion valves.
      d. Refrigerant strainers.

B. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.

1.05 CLOSEOUT SUBMITTALS

A. Section 01 77 00: Closeout procedures.

B. Operation and Maintenance Data: Submit instructions for replacing filter media.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.5 code for installation of refrigerant piping systems.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Dehydrate and charge refrigeration components including piping and receivers, seal prior to shipment. Maintain seal until connected into system.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

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.

PART 2 PRODUCTS

2.01 REFRIGERANT PIPING

A. Copper Tubing: ASTM B280, drawn.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

2.02 UNIONS, FLANGES, AND COUPLINGS

A. 2 inches and Smaller:
   1. Copper Pipe: Bronze, soldered joints.

2.03 PIPE HANGERS AND SUPPORTS

A. Refer to Section 22 05 00.

2.04 REFRIGERATION SPECIALTIES

A. Provide specialties associated with operational control and servicing of refrigeration circuits and systems.
   1. Moisture and liquid indicators (sight glass).
   2. Filter-driers and service valves: as recommended by condensing unit manufacturer.
   3. Thermal expansion valves - selected for evaporator coil tonnage.
   4. Strainers.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify pipe size with refrigeration equipment supplier.

B. Ream pipe and tube ends. Remove burrs.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment with unions.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.02 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

A. Install refrigeration piping as indicated on Drawings and specified in Section 23 05 00.
   1. Sleeve pipe passing through partitions, walls and floors.
   2. Install pipe identification.
   3. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
   4. Provide access where valves and fittings are not exposed.
   5. Install valves with stems upright or horizontal.

B. Install refrigerant piping in accordance with ASME B31.5.

C. Arrange refrigerant piping to return oil to compressor. Provide traps and loops in piping.

D. Slope horizontal piping 0.40 percent in direction of flow.

E. Flood refrigerant piping system with nitrogen when brazing.

F. Insulate suction piping and equipment; refer to Section 23 07 00.

G. Provide replaceable cartridge filter-dryers, with isolation valves and bypass with valve.

H. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

I. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

J. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

K. Provide electrical connection to solenoid valves. Refer to Division 26 for wiring requirements.

L. Fully charge completed system with refrigerant after testing.

M. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

3.03 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test refrigeration system with dry nitrogen to 200 psig. Perform final tests at 27 inches vacuum and 200 psig using electronic leak detector.

C. Repair leaks.

D. Retest until no leaks are detected.

END OF SECTION

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SECTION 23 31 00

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Duct Materials.
2. Insulated flexible ducts.
3. Single wall spiral round ducts.
4. Ductwork fabrication.
5. Hangers and Supports

B. Related Sections:
1. Section 09 91 00 - Painting and Coating: Product requirements for painting for placement by this section.
2. Section 23 05 00 – Common Work Results for HVAC:
   a. Administrative procedures.
   b. Identification and labeling requirements.
3. Section 23 07 00 – HVAC Insulation: Duct insulation requirements.
4. Section 23 33 00 – Air Duct Accessories: Connections to ductwork and accessories.

1.02 REFERENCES

A. ASTM International (ASTM):
1. A276 - Standard Specification for Stainless Steel Bars and Shapes.
2. A480 - Specification for General Requirements for Flat-Rolled Stainless And Heat-Resisting Steel Plate, Sheet and Strip.
3. A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
5. B209 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
6. D1784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
7. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. Underwriters Laboratories Inc. (UL):
1. 181 - Factory-Made Air Ducts and Connectors.
2. 723 - Tests for Surface Burning Characteristics of Building Materials.

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
1. HVAC Air Duct Leakage Test Manual.
2. HVAC Duct Construction Standards - Metal and Flexible; Third Edition – 2005.

1.03 PERFORMANCE REQUIREMENTS

A. Duct configurations resulting in higher friction or increased sound level are not permitted.

B. Insulated flexible ducts: Flame spread/smoke developed ratings not exceeding 25/50 (UL 723) when tested in accordance with ASTM E84.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards – Metal and Flexible.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Store PVC materials in shaded areas, away from direct sunlight.

B. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.

C. Maintain temperatures during and after installation of duct sealant.

PART 2 PRODUCTS

2.01 DUCT MATERIALS

A. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90/A90M for extension of existing systems.

B. Type 321 or 316 Stainless steel. ASTM A276.

C. Aluminum: 3003 alloy H 14 temper in accordance with ASTM B209.

D. Fasteners: Cadmium plated rivets, bolts, or sheet metal screws for new duct systems.

E. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.02 INSULATED FLEXIBLE DUCTS

A. Manufacturers:
   1. Flexmaster, Model Type 5M.
   2. Thermaflex, Model M-KE.

B. Product Description: Polymer film supported by helical-wound spring steel wire; fiberglass insulation; aluminized vapor barrier film.
   1. Rated as Class 1 Air Duct.
   2. Pressure Rating: 4 inches w.g. positive and 0.5 inches w.g. negative.
   3. Maximum Velocity: 4000 fpm.
   4. Temperature Range: -20 degrees F to 175 degrees F.
   5. Thermal Resistance: 4.2 square feet-hour-degree F per BTU.

2.03 SPIRAL DUCT

A. G-90 galvanized steel, SMACNA lock seam standard RL-1:
   1. Size 3 inch through 12 inch: 26 gauge.
   2. Size 14 inch through 24 inch: 24 gauge.

3. Size 26 inch through 42 inch: 22 gauge; Flange end reinforcing over 24 inch - Class A.
4. Sizes over 42 inch: 20 gauge with flange end reinforcing - Class C.

A. Aluminum, or PVC coated galvanized steel (both surfaces), SMACNA lock seam standard RL-1:
   1. Size 3 inch through 12 inch: 26 gauge.
   2. Size 14 inch through 24 inch: 24 gauge.
   3. Size 26 inch through 42 inch: 22 gauge; Flange end reinforcing over 24 inch - Class A.
   4. Sizes over 42 inch: 20 gauge with flange end reinforcing - Class C.

B. Lock formed spiral seams, rated for leakage class 3.

2.04 DUCTWORK FABRICATION

A. Fabricate and support ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Construct to 1.0 inch pressure classification unless otherwise indicated to use higher classification. Construct AHU-1 supply ducts to 2.0 inch pressure classification.

B. Construct T's, bends, and elbows with centerline radius equal to the duct width. Where not possible and where rectangular elbows are used, provide turning vanes.

C. Transition duct sizes gradually:
   1. Divergence: not to exceed 15 degrees where possible; maximum 30 degrees.
   2. Convergence: not to exceed 30 degrees where possible; maximum 45 degrees.

D. Provide 45-degree lateral wye takeoffs with balancing dampers. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections with balancing dampers.

E. Seal joints between duct sections and duct seams.
   1. Sealants, Mastics and Tapes: Conform to UL 181A. Provide products bearing appropriate UL 181A markings.

2.05 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:
   1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
   2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
   3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.06 SLEEVES

A. Refer to Section 23 05 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 30 00.

B. Verify sizes of equipment connections before fabricating transitions.

3.02 INSTALLATION

A. Duct Sealing:
   1. Supply Air Ducts: Class B: Transverse and longitudinal joints, up to 3-inch water gauge.
      Exceptions: Exposed ductwork in conditioned area served by the duct. No sealing required.
   2. Return Ducts: No sealing required.
      Exceptions: Ducts located in unconditioned spaces such as attics. Class C.
   3. Outside Air Ducts: Class C: Transverse joints, up to 2-inch water gauge.
   4. Exhaust Ducts: Class C: Transverse joints, up to 2-inch water gauge.
   5. Combustion Air Ducts: Class B: No sealing required.

B. Pressure Classification: In accordance with SMACNA HVAC Construction Standards - Standard and Standard VAV construction requirements.

C. Provide manual balancing dampers at branch duct connections to the trunk duct and provide balancing dampers on trunk ducts serving a single inlet or outlet.

D. Protect installed ductwork from construction dust by installing temporary closures of metal or taped polyethylene on open ends of ductwork.

E. Wipe construction dust and debris from duct interior immediately prior to installation.

F. Install duct hangers and supports in accordance with Section 23 05 00.
   1. Cable supports are only acceptable were ductwork is concealed or in mechanical rooms.

G. Use double nuts and lock washers on threaded rod supports.

H. Connect flexible ducts to metal ducts with adhesive and draw bands.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Connect diffuser boots to low pressure ducts with 5 feet minimum length of flexible duct.

B. Connect air outlets and inlets directly to sheet metal ductwork.

C. Provide 2 inch wide flexible connectors at equipment inlets and outlets.

3.04 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
   5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports. Do not use cable hangers unless approved by architect.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.05 INSTALLATION - SLEEVES

A. Set sleeves in position in forms. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through wet floors 1 inch above finished floor level. Caulk sleeves.

D. Where ductwork penetrates floor, ceiling, or wall, close off space between duct and adjacent work with stuffing or firestopping insulation and caulk airtight.

3.06 INSTALLATION - FIRESTOPPING

A. Refer to Section 23 05 00.

3.07 CLEANING

A. Refer to Section 01 70 00.

3.08 PAINTING

A. Paint visible portion of ductwork behind air outlets and inlets matte black.

B. Refer to Section 09 91 00.

C. Prepare exposed, unfinished duct, fittings, supports, and accessories ready for finish painting.
   1. Acrylic Finish: Two finish coats over a primer that is compatible with material and finish coat paint.
   2. Color: Final color as selected by Architect.

3.09 SCHEDULES

A. Ductwork Material Schedule:

AIR SYSTEM	MATERIAL
Supply and Return	Steel, galvanized
Relief, Toilet Exhaust and Transfer	Steel, galvanized
Outside Air, General Exhaust	Steel, galvanized
Combustion Air	Steel, galvanized

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Motorized dampers.
2. Back-draft dampers.
3. Duct access doors.
4. Fire dampers.
5. Combination fire/smoke dampers
6. Volume control dampers.
7. Flexible duct connections.

B. Related Sections:
1. Section 23 09 00 – Instrumentation and Control for HVAC: Execution and Product requirements for connection and control of Combination Smoke and Fire Dampers for placement by this section.
2. Section 23 31 00 – HVAC Ducts and Casings: Requirements for duct construction and pressure classifications.
3. Section 26 27 26 – Wiring Devices: Execution requirements for connection of electrical Combination Smoke and Fire Dampers specified by this Section.

1.02 REFERENCES

A. Air Movement and Control Association International, Inc. (AMCA):
1. 500 - Test Methods for Louvers, Dampers, and Shutters.

B. ASTM International (ASTM):
1. E1 - Standard Specification for ASTM Thermometers.

C. National Fire Protection Association (NFPA):
1. 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
2. 92A - Recommended Practice for Smoke-Control Systems.

D. Sheet Metal and Air Conditioning Contractors (SMACNA):
1. HVAC Duct Construction Standard - Metal and Flexible.

E. Underwriters Laboratories Inc. (UL):
1. 555 - Standard for Safety for Fire Dampers.
2. 555C - Standard for Safety for Ceiling Dampers.
3. 555S - Standard for Safety for Smoke Dampers.

1.03 SUBMITTALS

A. Refer to Section 01 33 00.

B. Product Data: For fire dampers submit the following:
   1. UL ratings, pressure drop and maximum pressure data.
   2. Indicate materials, construction, dimensions, and installation details.

C. Manufacturer's Installation Instructions: Submit for Fire Dampers.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Refer to Section 01 70 00.

B. Project Record Documents: Record actual locations of access doors.

C. Operation and Maintenance Data: Submit for motorized dampers and fire dampers.

1.05 QUALITY ASSURANCE

A. Dampers tested, rated and labeled in accordance with the latest UL requirements.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 01 60 00.

B. Protect dampers from damage to operating linkages and blades.

C. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

D. Storage: Store materials in a dry area indoor, protected from damage.

E. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

1.08 COORDINATION

A. Refer to Section 01 30 00.

B. Coordinate Work where appropriate with building control Work and fire alarm system installation.

PART 2 PRODUCTS

2.01 MOTORIZED DAMPERS

A. Manufacturers:
   1. Arrow.

2. Cesco.
3. Greenheck.
4. Pottorff.
5. Ruskin.
6. Titus.
7. United Enertech.
8. Or approved equal.

B. Description:
1. Frames: 6 inch wide 16 gauge.
2. Blades: Maximum spacing 6 inches, 16 gauge, 48 inches maximum length.
3. Linkage: 12-gauge plated steel brackets riveted to the blades wit aluminum rod locked pivots.
4. Bearings: Oilite bronze.
5. Axles: Extendable from motor actuator attachment.
6. Seals: Blade and jamb of polyurethane.
7. Motors: Heavy duty 24 volt with spring return.
8. Dampers shall be suitable for velocities up to 2000 FPM and Class 2 [Class 1], low leakage construction.
9. Dampers shall be louver size, wall opening size, roof opening size or duct size as scheduled on Drawings.

C. Outside air/exhaust dampers to outside are to be Class 1, low leak type: No more than 8 CFM/S.F. leakage at 4 inches w.c. static pressure, with operator exerting 6 inch - lbs. of torque.

D. Furnish and install Belimo, or approved equal, 24V electric actuators with spring return for each damper above of ample output for actuation and shut-off:
1. Each damper shall be normally fully closed and shall fully open whenever associated fan is energized.

E. Power and control wiring shall be provided by Section 23 09 00.

2.02 BACKDRAFT DAMPERS

A. Manufacturers:
1. Arrow.
2. Cesco.
3. Greenheck.
4. Pottorff.
5. Ruskin.
6. Titus.
7. United Enertech.
8. Or approved equal.

B. Description:
1. Multi-blade, parallel-action; start-to-open (STO) at 0.01 inch water gauge static pressure.
2. Galvanized steel or extruded aluminum frame.
3. Blades:
a. Maximum 6 inch width.
b. With felt or flexible vinyl sealed edges.
c. Linked together in rattle-free manner with 90-degree stop.

d. Steel ball bearings and axles.

C. Basis of Design:
1. Greenheck WD-100 series for horizontal mounting under relief gravity hood.
2. Greenheck WD-400 series for vertical mounting (STO at 0.026-inch w.g. pressure).

D. Gravity Balanced Backdraft Damper
1. Product Description: Multi-Blade, back-draft dampers: Parallel-action, gravity-balanced, Galvanized extruded aluminum. Blades, maximum 6-inch width, with felt or flexible vinyl sealed edges. Blades linked together in rattle-free manner with 90-degree stop, steel ball bearings, and plated steel pivot pin. Furnish dampers with adjustment device to permit setting for varying differential static pressure.

2.03 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

2.04 DYNAMIC FIRE DAMPERS

A. Manufacturers:
1. Arrow.
2. Cesco.
3. Louvers and Dampers, Inc.
4. National Controlled Air.
5. Pottorff.
6. Ruskin.
7. United Enertech.
8. Or approved equal.

B. Fire Rating: UL 555 classified and labeled as a 1-1/2 hour dynamic fire damper.

C. Air Flow Rating: UL approved for dual directional air flow.

D. Integral Sleeve Frame: Minimum 20 gauge by 12 inches roll formed, galvanized steel.
1. Factory Sealant: Apply to dampers in HVAC systems with pressures to maximum 4 inches wg.

E. Blades:
1. Style: Curtain type, in airstream.
2. Action: Spring or gravity closure upon fusible link release.
3. Orientation: Horizontal.
4. Material: Minimum 24-gauge roll-formed, galvanized steel.

F. Closure Springs: Type 301 stainless steel, constant force type, if required.

G. Closure Rating: 3000 feet per minute vertical and horizonal mount, 4 in. w.g. maximum pressure.

H. Temperature Release Device:
1. Fusible link, 165 degrees F.

I. Finish: Mill galvanized.

2.05 COMBINATION FIRE/SMOKE DAMPERS

A. Manufacturers
   1. Arrow.
   2. Cesco.
   3. Greenheck.
   4. Pottorff.
   5. Ruskin.
   6. National Controlled Air.
   7. United Enertech.
   8. Or approved equal.

B. Construction:
   1. Fabricate in accordance with NFPA 90A and UL 555S.
   2. Fire Resistance: 1-1/2 hours, Classified at 250 degrees F.
   3. Leakage Rating: Class II, maximum of 20 cfm at 4 inches wg differential pressure.
   4. Activation Temperature and Device: 165 degrees F, snap disk (resettable).
   5. Frame: 16-gauge, galvanized steel.
   6. Blades:
      a. Material: 16-gauge roll formed galvanized steel.
      b. Action: Opposed.
      c. Orientation: Horizontal.
      d. Width: Maximum 6 inches.
   7. Bearings: Bronze, oilite or stainless, press-fit into frame.
   8. Seals: Pressure sensitive. Air pressure assists sealing effects.
   9. Linkage: 1/8-inch thick plated steel bars, concealed in frame.
   10. Actuator:
      a. Type: Electric 24-volt, 60 hertz, two-position, fail close.
      b. Mounting: External.
   11. Finish: Mill galvanized.
   12. Sleeve: 20-gauge sleeve, wrapped in thermal blanket.
   13. Approved for horizontal or vertical installation.

C. Actuator:
   1. 24-volt ac actuator rated for Smoke damper applications. UL 555S.

D. Basis of Design:
   1. National Controlled Air Model FSD-3V-OW-212.

2.06 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

B. Single Blade Dampers:
   1. Material: Same gauge as duct to 24 inches size in both dimensions, and 2 gauges heavier for sizes over 24 inches.
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.
   4. Fabricate for duct sizes up to 6 inches by 30 inches.

C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 inches by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware.

D. End Bearings: Except in round ductwork 12 inches and smaller, furnish end bearings. On multiple blade dampers, furnish oil-impregnated nylon or sintered bronze bearings. Furnish closed end bearings on ducts having pressure classification over 2 inches wg.

E. Quadrants:
   1. Furnish locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches furnish regulator at both ends.

F. Remote Damper Operators:
   1. Cable Remote system designed for remote manual damper adjustment.
   2. Tubing: Aluminum.
   3. Cable: Stainless steel.
   4. Wall Mounting Box: Recessed.
   5. Provide where finishes will prevent access to quadrants regulators.

2.07 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

B. Metal-Edged Connectors: Flame-retardant or noncombustible fabrics. Comply with UL 181, Class 1. Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips galvanized sheet steel or aluminum sheets. Provide metal compatible with connected ducts.

2.08 OUTSIDE AIR SYSTEM [FOR FURNACE RETURN]

A. Acceptable Manufacturers:
   1. Field Controls.
   2. AprilAire.
   3. Or approved equal.

B. Motorized Damper: 24V motor, spring return, 100,000 cycle.

C. Ventilation Controller
   1. Normal or Economy mode of operation.
   2. Multiple climate Application modes: Normal, Hot, Cold, or Disabled.
   3. Compatible with any HVAC system having 24V RWYG terminals:
      a. Conventional Heat/Cool HVAC Systems.
      b. Heat Pump Systems.
      c. Hydronic Air Handlers.
      d. Stand-alone Configuration.
   4. Outdoor Air Temperature Sensor.
   5. Basis of Design: Field Controls model FAV.

PART 3 EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 30 00.

B. Verify rated walls are ready for fire damper installation.

C. Verify ducts and equipment installations are ready for accessories.

D. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.02 INSTALLATION.

A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Install back-draft dampers on gravity relief hoods.

C. Access Doors: Install access doors at the following locations:
   1. Before and after each duct mounted coil.
   2. At each fire damper.
   3. Before and after each automatic control damper.

D. Access Door Sizes: Install minimum 8 by 8 inch size for hand access, 18 by 18 inch size for shoulder access. Review locations prior to fabrication.
   1. Mark access doors for fire dampers on outside surface, with minimum 1/2 inch high letters reading: FIRE DAMPER.

3.03 DEMONSTRATION

A. Refer to Section 01 70 00

B. Demonstrate re-setting of fire dampers to Owner's representative.

END OF SECTION

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SECTION 23 34 00

HVAC FANS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Centrifugal roof fans.
   2. Upblast centrifugal roof fans.
   3. Utility set exhaust fan.
   4. Inline dryer exhaust fan.
   5. Propeller wall fans.
   6. Inline fans.
   7. Cabinet fans
   8. Ceiling fans
   9. Axial fans
   10. Air Curtains
   11. Duct Silencers

B. Related Sections:
   1. Section 09 91 00 - Painting and Coating: Product and execution requirements for painting specified by this section.
   2. Section 23 00 00 – Common Work Results for HVAC.
   3. Section 26 27 26 – Wiring Devices.

1.02 REFERENCES

A. Air Movement and Control Association International, Inc. (AMCA):
   1. 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
   2. 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

B. Underwriters Laboratories Inc. (UL):
   1. 705 - Power Ventilators.

1.03 SUBMITTALS

A. Refer to Section 01 33 00.

B. Product Data: Submit data on each type of fan and include accessories, fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Submit fan manufacturer’s instructions.

1.04 CLOSEOUT SUBMITTALS

A. Refer to Section 01 70 00.

B. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.05 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

C. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3-years experience.

B. Installer: Company specializing in performing Work of this Section with minimum 3-years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 01 60.

B. Protect motors, shafts, and bearings from weather and construction dust.

PART 2 PRODUCTS

2.01 DOWNBLAST CENTRIFUGAL ROOF FANS (PRV'S)

A. Manufacturers:
   1. Loren Cook Company.
   2. Penn Ventilator.
   3. Acme Engineering and Manufacturing Corp.
   4. Greenheck Corp.
   5. Twin City Fan.

B. PRV: UL 705 listed, roof mounted, downblast fan.

C. Bolted and welded construction utilizing corrosion resistant fasteners.

D. Provide aluminum structural components constructed of 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure.

E. Motor: Permanently lubricated sealed ball bearings.

F. Provide NEMA 4X disconnect within PRV enclosure.

G. Furnish 14-inch insulated roof curb.

H. Provide wall sleeve suitable for supporting fan.

I. Provide 120 volt motor operated damper.

J. Provide birdscreen at fan discharge.

2.02 UPBLAST CENTRIFUGAL ROOF FANS (PRV'S)

A. Manufacturers:
   1. Loren Cook Company.
   2. Penn Ventilator.
   3. Acme Engineering and Manufacturing Corp.
   4. Greenheck Corp.
   5. Twin City Fan.

B. PRV: UL 705 listed, roof mounted, upblast fan.

C. Bolted and welded construction utilizing corrosion resistant fasteners.

D. Provide aluminum structural components constructed of 16-gauge marine alloy aluminum, bolted to a rigid aluminum support structure.

E. Motor: Permanently lubricated sealed ball bearings.

F. Provide NEMA 4X disconnect within PRV enclosure.

G. Furnish 14-inch insulated roof curb.

H. Provide wall sleeve suitable for supporting fan.

I. Damper (Greenheck Model VCD-23):
   1. 5 inch by 1 inch, 16-gauge galvanized steel hat channel frame.
   2. Galvanized steel axles.
   3. 3V style 16-gauge galvanized steel blades with vinyl blade seals.
   4. Synthetic (non-metallic) bearings.
   5. 120 VAC, 60 Hertz, motor operated, two position; Power open and spring return to close.
   6. Actuator and linkage located out of the airstream.

2.03 TRANSFER FAN

A. Manufacturers:
   1. Loren Cook Company.
   2. Penn Ventilator.
   3. Acme Engineering and Manufacturing Corp.
   4. Greenheck Corp.
   5. Twin City Fan.

B. Description:
   1. Belt drive with galvanized steel housing, integral inlet cone, removable access doors on three sides, inlet and outlet duct collar, gravity backdraft damper in discharge, horizontal hanging brackets.
   2. Fan wheel: Backward inclined centrifugal type, aluminum construction.
   3. 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 at mid-position; fan shaft with self aligning pre-lubricated ball bearings.
   4. Motor and Drive Mounting: Out of the airstream.
   5. Motor: Open drip-proof or totally enclosed fan cooled.
   6. Bearings: ABMA 9 life at 200,000 hours.
   7. Accessories:
      a. Belt guard.
      b. Flexible duct connections.
      c. Filter box with throw away type filter.
      d. Disconnect switch: NEMA 250 enclosure.

2.04 TAILPIPE EXHAUST FAN

A. Manufacturers:

1. Loren Cook Company.
2. Penn Ventilator.
3. Acme Engineering and Manufacturing Corp.
4. Greenheck Corp.
5. Twin City Fan and Blower.

B. Description:
1. Fan housing:
a. Direct drive utility set configuration.
b. Steel, with lockseam construction.
c. Finish: 2-4 mils of electrostatically applied and baked polyester urethane.
d. Inlet and Outlet:
1) Slip fit or punched flange construction.
2. Fan wheel:
a. Radial type.
b. Statically and dynamically balanced.
c. Manufactured with aluminum blades, riveted to aluminum inlet and back plates.
d. Wheel and fan inlet carefully matched and have precise running tolerances for maximum performance and operating efficiency.
3. Fan motor and drive:
a. Motor: EPACT (Energy Policy ACT) efficiencies. NEMA T-frame, 3600 RPM (2 pole), and Totally Enclosed Fan Cooled (TEFC) with a 1.15 service factor.
b. Arrangement 4; direct drive with the radial wheel attached directly to the motor shaft.

C. Basis of Design: Greenheck Model FPB 100H-M20.
1. 700 CFM at 5.0 inch static pressure, 1.32 BHP, 3500 RPM, 68 pounds.

2.05 DRYER VENT BOOSTER FAN

A. Acceptable Manufacturers:
1. Tjernlund.

B. Description:
1. Direct drive booster fan with self cleaning wheel and housing assembly.
2. Fan wheel: Radial open blade design.
3. Motor and Drive Mounting: Out of the airstream.
4. Motor: Open drip-proof or totally enclosed fan cooled.
5. Accessories:
a. Disconnect switch: NEMA 1 enclosure.

2.06 PROPELLER FANS

A. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.

B. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.

C. Fan Wheel: Replaceable, [cast] [extruded]-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.

D. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

E. Fan Drive:
   1. Resiliently mounted to housing.
   2. Statically and dynamically balanced.
   3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
   4. Extend grease fitting to accessible location outside of unit.
   5. Service Factor Based on Fan Motor Size: 1.4.
   6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
   7. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
   8. Ball-Bearing Rating Life: ABMA 9, [L10 of 100,000 hours] <Insert life>.
   9. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
   10. Motor Pulleys: Adjustable pitch for use with motors through [5] <insert value> hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
   11. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
   12. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

F. Accessories:
   1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
   2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
   3. Wall Sleeve: Galvanized steel to match fan and accessory size.
   4. Weathershield Hood: Galvanized steel to match fan and accessory size.
   5. Weathershield Front Guard: Galvanized steel with expanded metal screen.
   6. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
   7. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

G. Vibration Isolators:
   1. Type: [Elastomeric hangers] [Spring isolators] [Restrained spring isolators] <Insert type>.
   2. Static Deflection: [1 inch (25 mm)] <Insert value>.

H. Spark Arrestance Class: [A] [B] [C].

2.07 CEILING FANS

A. [typically spec'd by electrical]

B. 36-72" prop fans

C. 72-240" prop fans HVLS (High Volume Low Speed)

D. "Big Ass Fans"; Schwank; or approved equal

2.08 INLINE FANS

A. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

B. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing[; with wheel, inlet cone, and motor on swing-out service door].

C. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

E. Accessories:
   1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
   2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
   3. Companion Flanges: For inlet and outlet duct connections.
   4. Fan Guards: 1/2- by 1-inch (13- by 25-mm) mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
   5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

F. Vibration Isolators:
   1. Type: [Elastomeric hangers] <Insert type>.
   2. Static Deflection: [1 inch (25 mm)] <Insert value>.

G. Spark Arrestance Class: [A] [B].

2.09 CABINET FANS (BATH FAN)

A. Housing: Steel, lined with acoustical insulation.

B. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

C. Grille: [Plastic] [Stainless steel] [Aluminum] [Painted aluminum], louvered grille with flange on intake and thumbscrew attachment to fan housing.

D. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

E. Accessories:
   1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
   2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
   3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
   4. Motion Sensor: Motion detector with adjustable shutoff timer.
   5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
   6. Filter: Washable aluminum to fit between fan and grille.
   7. Isolation: Rubber-in-shear vibration isolators.

8. Manufacturer's standard roof jack or wall cap, and transition fittings. Finish color per Architect.

2.10 TUBEAXIAL FANS

A. Description: Fan wheel and housing, factory-mounted motor with [belt] [or] [direct] drive, an inlet cone section, and accessories.

B. Housings: [Steel] [Galvanized steel] [Aluminum] [Fiberglass-reinforced plastic] [Stainless steel] with flanged inlet and outlet connections.

C. Wheel Assemblies: Cast or extruded aluminum with airfoil-shaped blades mounted on cast-iron wheel plate keyed to shaft with solid-steel key.

D. Wheel Assemblies: Fiberglass-reinforced plastic cured under pressure with airfoil-shaped blades keyed to stainless-steel shaft.

E. Wheel Assemblies: Cast aluminum, machined and fitted to shaft.

F. Belt Drives:
   1. Factory mounted, with adjustable alignment and belt tensioning.
   2. Service Factor Based on Fan Motor Size: [1.2] [1.3] [1.4] [1.5].
   3. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
   4. Fan Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
   5. Motor Pulleys: Adjustable pitch for use with motors through [5] <Insert value> hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
   6. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
   7. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.
   8. Motor Mount: Adjustable base.
   9. Shaft Bearings: Radial, self-aligning bearings.
      a. Ball-Bearing Rating Life: ABMA 9, [L10 of 50,000 hours] <Insert life>.
      b. Roller-Bearing Rating Life: ABMA 11, [L10 of 50,000 hours] <Insert life>.
      c. Extend lubrication lines to outside of casing and terminate with grease fittings.

G. Accessories:
   1. Companion Flanges: Rolled flanges of same material as housing.
   2. Inspection Door: Bolted door allowing limited access to internal parts of fan, of same material as housing.
   3. Propeller Access Section Door: Short duct section bolted to fan [inlet] [and] [outlet] allowing access to internal parts of fan for inspection and cleaning, of same material as housing.
   4. Swingout Construction: Assembly allowing entire fan section to swing out from duct for cleaning and servicing, of same material as housing.
   5. Mounting Clips: [Horizontal ceiling] [Vertical mounting] clips welded to fan housing, of same material as housing.
   6. Horizontal Support: Pair of supports bolted to fan housing, of same material as housing.
   7. Vertical Support: Short duct section with welded brackets bolted to fan housing, of same material as housing.

8. Inlet Screen: Wire-mesh screen on fans not connected to ductwork, of same material as housing.
9. Outlet Screen: Wire-mesh screen on fans not connected to ductwork, of same material as housing.
10. Backdraft Dampers: Butterfly style, for bolting to the discharge of fan or outlet cone, of same material as housing.
11. Shaft Seal: Elastomeric seal and Teflon wear plate, suitable for up to 300 deg F (149 deg C).
12. Motor Cover: Cover with side vents to dissipate motor heat, of same material as housing.
13. Inlet Vanes: Adjustable; with peripheral control linkage operated from outside of airstream, bronze sleeve bearings on each end of vane support, and provision for manual or automatic operation of same material as housing.
14. Inlet Bell: Curved inlet for when fan is not attached to duct, [of same material as housing] [aluminum].
15. Inlet Cone: Round-to-round transition of same material as housing.
16. Outlet Cone: Round-to-round transition, of same material as housing.
17. Stack Cap: Vertical discharge assembly with backdraft dampers, of same material as housing.
18. Direct-Driven Units: Encase motor in housing outside of airstream[, factory wired to disconnect switch located on outside of fan housing]. Extend lubrication lines to outside of casing and terminate with grease fittings.

H. Factory Finishes:
1. Sheet Metal Parts: Prime coat before final assembly.
2. Exterior Surfaces: Baked-enamel finish coat after assembly.
3. Coatings: [Thermoplastic vinyl] [Epoxy] [Zinc] [Synthetic resin] [Phenolic] [Color-match enamel] [Polytetrafluoroethylene] [Vinyl ester] [Hot-dip galvanized] [Powder-baked enamel]; <Insert manufacturer's name and trade name>.
4. Apply to finished housings.
5. Apply to fan wheels.

2.11 VANEAXIAL FANS

A. Description: Fan wheel and housing, straightening vane section, factory-mounted motor with belt drive or direct drive, an inlet cone section, and accessories.
1. Variable-Pitch Fans: Internally mounted [pneumatic] [electric] [electronic] actuator, externally-mounted positive positioner, and mechanical-blade-pitch indicator.

B. Housings: [Steel] [Galvanized steel] [Aluminum] [Fiberglass-reinforced plastic] [Stainless steel].
1. Inlet and Outlet Connections: Flanges.
2. Guide Vane Section: Integral guide vanes downstream from fan wheel designed to straighten airflow.
3. Sound-Trap Housing: Housing incorporating perforated steel inner liner, 2 inch (50 mm) fiberglass duct liner sandwiched between the inner and outer shell, and steel bands sealing the insulated cavity.

C. Wheel Assemblies: Cast aluminum with airfoil-shaped blades mounted on cast-iron wheel plate keyed to shaft with solid-steel key.

D. Wheel Assemblies: Fiberglass-reinforced plastic cured under pressure with airfoil-shaped blades keyed to stainless-steel shaft.

E. Wheel Assemblies: Cast-aluminum hub assembly, machined and fitted with threaded bearing wells to receive blade-bearing assemblies with replaceable, cast-aluminum blades; factory mounted and balanced.

F. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.
   1. Service Factor Based on Fan Motor Size: [1.2] [1.3] [1.4] [1.5].
   2. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
   3. Fan Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
   4. Motor Pulleys: Adjustable pitch for use with motors through [5] <Insert value> hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
   5. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
   6. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.
   7. Motor Mount: Adjustable base.
   8. Shaft Bearings: Radial, self-aligning bearings.
      a. Ball-Bearing Rating Life: ABMA 9, [L10 of 100,000 hours] <Insert life>.
      b. Roller-Bearing Rating Life: ABMA 11, [L10 of 100,000 hours] <Insert life>.
      c. Extend lubrication lines to outside of casing and terminate with grease fittings.

G. Accessories:
   1. Companion Flanges: Rolled flanges of same material as housing.
   2. Inspection Door: Bolted door allowing limited access to internal parts of fan, of same material as housing.
   3. Propeller Access Section Door: Short duct section bolted to fan [inlet] [and] [outlet] allowing access to internal parts of fan for inspection and cleaning, of same material as housing.
   4. Swingout Construction: Assembly allowing entire fan section to swing out from duct for cleaning and servicing, of same material as housing.
   5. Mounting Clips: [Horizontal ceiling] [Vertical mounting] clips welded to fan housing, of same material as housing.
   6. Horizontal Support: Pair of supports bolted to fan housing, of same material as housing.
   7. Vertical Support: Short duct section with welded brackets bolted to fan housing, of same material as housing.
   8. Inlet Screen: Wire-mesh screen on fans not connected to ductwork, of same material as housing.
   9. Outlet Screen: Wire-mesh screen on fans not connected to ductwork, of same material as housing.
   10. Backdraft Dampers: Butterfly style, for mounting with flexible connection to the discharge of fan or direct mounted to the discharge diffuser section, of same material as housing.
   11. Stall Alarm Probe: Sensing probe capable of detecting fan operation in stall and signaling control devices. Control devices and sequence of operation are specified in Section 230993 "Sequence of Operations for HVAC"
   12. Flow Measurement Port: Pressure measurement taps installed in the inlet of fan to detect and signal airflow readings to temperature-control systems. Control devices and sequence of operation are specified in Section 230993 "Sequence of Operations for HVAC."

13. Shaft Seal: Elastomeric seal and Teflon wear plate, suitable for up to 300 deg F (148 deg C).
14. Motor Cover: Cover with side vents to dissipate motor heat, of same material as housing.
15. Inlet Vanes: Adjustable; with peripheral control linkage operated from outside of airstream, bronze sleeve bearings on each end of vane support, and provision for manual or automatic operation, of same material as housing.
16. Inlet Bell: Curved inlet for when fan is not attached to duct, of same material as housing.
17. Inlet Cone: Round-to-round transition, of same material as housing.
18. Outlet Cone: Round-to-round transition, of same material as housing.
19. Stack Cap: Vertical discharge assembly with backdraft dampers, of same material as housing.
20. Direct-Driven Units: Encase motor in housing outside of airstream[, factory wired to disconnect switch located on outside of fan housing]. Extend lubrication lines to outside of casing and terminate with grease fittings.

H. Factory Finishes:
1. Sheet Metal Parts: Prime coat before final assembly.
2. Exterior Surfaces: Baked-enamel finish coat after assembly.
3. Coatings: [Thermoplastic vinyl] [Epoxy] [Zinc] [Synthetic resin] [Phenolic] [Color-match enamel] [Polytetrafluoroethylene] [Vinyl ester] [Hot-dip galvanized] [Powder-baked enamel]; <Insert manufacturer's name and trade name>.
4. Apply to finished housings.
5. Apply to fan wheels.

2.12 MIXED FLOW FANS

A. Description: Fan wheel and housing,[straightening vane section,] factory-mounted motor with belt drive, and accessories.

B. Housings: [Steel] [Galvanized steel] [Aluminum].
1. Inlet and Outlet Connections: Outer mounting frame and companion flanges.
2. Guide Vane Section: Integral guide vanes downstream from fan wheel designed to straighten airflow.
3. Mixed-Flow Outlet Connection: [One] [Two] flanged discharge(s) perpendicular to fan inlet.

C. Wheel Assemblies: Cast aluminum with airfoil-shaped blades mounted on cast-iron wheel plate keyed to shaft with solid-steel key.
1. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.
2. Service Factor Based on Fan Motor Size: [1.2] [1.3] [1.4] [1.5].
3. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
4. Fan Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
5. Motor Pulleys: Adjustable pitch for use with motors through [5] <Insert value> hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
6. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

D. Motor Mount: Adjustable base.
   1. Shaft Bearings: Radial, self-aligning bearings.
      a. Ball-Bearing Rating Life: ABMA 9, [L10 of 100,000 hours] <Insert life>.
      b. Roller-Bearing Rating Life: ABMA 11, [L10 of 100,000 hours] <Insert life>.
      c. Extend lubrication lines to outside of casing and terminate with grease fittings.

E. Accessories:
   1. Mounting Clips: [Horizontal ceiling] [Vertical mounting] clips welded to fan housing, of same material as housing.
   2. Inlet and Outlet Screens: Wire-mesh screen on fans not connected to ductwork, of same material as housing.
   3. Backdraft Dampers: Butterfly style, for mounting with flexible connection to the discharge of fan or direct mounted to the discharge diffuser section, of same material as housing.
   4. Motor Cover: Cover with side vents to dissipate motor heat, of same material as housing.
   5. Inlet Bell: Curved inlet for when fan is not attached to duct, of same material as housing.
   6. Inlet Cones: Round-to-round transition, of same material as housing.
   7. Outlet Cones: Round-to-round transition, of same material as housing.
   8. Stack Cap: Vertical discharge assembly with backdraft dampers, of same material as housing.
   9. Direct-Driven Units: Encase motor in housing outside of airstream[, factory wired to disconnect switch located on outside of fan housing].

F. Factory Finishes:
   1. Sheet Metal Parts: Prime coat before final assembly.
   2. Exterior Surfaces: Baked-enamel finish coat after assembly.
   3. Coatings: [Thermoplastic vinyl] [Epoxy] [Zinc] [Synthetic resin] [Phenolic] [Color-match enamel] [Polytetrafluoroethylene] [Vinyl ester] [Hot-dip galvanized] [Powder-baked enamel]; <Insert manufacturer's name and trade name>.
   4. Apply to finished housings.
   5. Apply to fan wheels.

2.13 AIR CURTAINS

2.14 DUCT SILENCERS?

A. Description: Tubular [with center cone] silencers consisting of a shell with fill material.

B. Description: Rectangular silencers [with elbow] consisting of a shell with fill material.

C. Housings: [Steel] [Galvanized steel] [Aluminum] [Fiberglass-reinforced plastic] [Stainless steel] with flanged inlet and outlet connections matching fan or cone sizes.
   1. Inner Shell: [Steel] [Galvanized steel] [Aluminum] [Fiberglass-reinforced plastic] [Stainless steel].
   2. Liner: Duct liner.

D. Factory Finishes:
   1. Sheet Metal Parts: Prime coat before final assembly.
   2. Exterior Surfaces: Baked-enamel finish coat after assembly.

3. Coatings: [Thermoplastic vinyl] [Epoxy] [Zinc] [Synthetic resin] [Phenolic] [Color-match enamel] [Polytetrafluoroethylene] [Vinyl ester] [Hot-dip galvanized] [Powder-baked enamel]; <Insert manufacturer's name and trade name> applied to finished housings.

E. Capacities and Characteristics:
   1. See Plans and Schedules.
   2. Airflow: <Insert cfm (L/s)>.
   3. Static Pressure Drop: <Insert inches wg (Pa)>.
   4. Diameter: <Insert inches (mm)>.
   5. Sound Attenuation (Insertion Loss):
      a. 1st Octave: <Insert dB>.
      b. 2nd Octave: <Insert dB>.
      c. 3rd Octave: <Insert dB>.
      d. 4th Octave: <Insert dB>.
      e. 5th Octave: <Insert dB>.
      f. 6th Octave: <Insert dB>.
      g. 7th Octave: <Insert dB>.
      h. 8th Octave: <Insert dB>.

F. Vibration Isolators: [Spring] [Restrained spring] <Insert type> isolators having a static deflection of [1 inch (25 mm)] <Insert deflection>.

G.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof curbs are installed as instructed by manufacturer.

3.02 PREPARATION

A. Coordinate roof curb flashing and installation with Architect and Roofing Contractor.

B. Refer to drawings for curb installation detail.

3.03 INSTALLATION

A. Install dampers on inlet to roof exhaust fans.

B. Install motor operated dampers [within] below roof curb of roof exhaust fans.

3.04 DEMONSTRATION

A. Refer to Section 01 70 00.

B. Demonstrate fan operation and maintenance procedures.

END OF SECTION

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SECTION 23 36 00

AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Variable volume terminal units.

B. Related Sections:
   1. Section 23 05 00 - Common Work Results for HVAC: Administrative procedures, installation requirements for terminal units for placement by this section.
   2. Section 23 09 00 - Instrumentation and Control for HVAC: Product requirements for control components to interface with air terminal units.
   3. Section 23 09 93 - Sequence of Operations for HVAC Controls: Sequences of operation applying to units in this section.
   4. Division 26 – Electrical: Product and execution requirements for electrical connections to air terminal units specified by this section.

1.02 REFERENCES

A. American Refrigeration Institute:
   1. ARI 880 - Air Terminals.
   2. ARI 885 -Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.

B. National Electrical Manufacturers Association:
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. Underwriters Laboratories Inc.:
   1. UL 181 - Factory-Made Air Ducts and Connectors.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal procedures.

B. Product Data: Submit data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings indicating airflow, static pressure, heating coil capacity and NC designation. Include connection requirements. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressure of 1 inch wg.

C. Manufacturer's Installation Instructions: Submit support and hanging details, and service clearances required.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Contract Closeout: Closeout procedures.

B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.

1.05 QUALITY ASSURANCE

A. Test and rate air terminal units performance for air pressure drop, flow performance, and acoustical performance in accordance with ARI 880 and ARI 885. Attach ARI seal to each terminal unit.

PART 2 PRODUCTS

2.01 SINGLE DUCT VARIABLE VOLUME AIR TERMINAL UNITS

A. Acceptable Manufacturers:
1. Anemostat Air Products.
2. Enviromental Technologies, Inc. (Enviro-Tec)
3. Krueger.
4. Titus.
5. The Trane Co.
6. MetalAire.

B. Product Description: Variable air volume terminal units for connection to central air systems, with digital controls and electric heating coils.

C. Identification: Furnish each air terminal unit with identification label and airflow indicator. Include unit nominal airflow, maximum factory-set airflow and minimum factory-set airflow and coil type.

D. Basic Assembly:
1. Casings: Minimum 22 gauge galvanized steel.
2. Lining: Minimum 1/2 inch thick neoprene or vinyl coated glass fiber insulation, 1.5 lb./cu ft density, meeting NFPA 90A requirements and UL 181 erosion requirements.
3. Plenum Air Inlets: Round stub connections for duct attachment.
4. Plenum Air Outlets: S slip-and-drive connections.

E. Basic Unit:
1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
2. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings; maximum damper leakage: 2 percent of design air flow at 1 inch w.g. inlet static pressure.
3. Mount damper operator to position damper as indicated on Drawings.

F. Attenuation Section: Line attenuation sections with 1 inch thick glass fiber insulation.

2.02 DAMPER ACTUATOR, PROVIDED WITH VAV TERMINALS

A. Manufacturers:
1. Belimo.
2. Honeywell.
3. Johnson.
4. Siemens.

B. Description:
   1. Electronic modulating damper actuator.
   2. UL listed and protected from overload at all angles of rotation.
   3. Direct coupled type, with shaft clamp and selectable direction of rotation.
   4. Power: 5.5 VA at 24V AC.
   5. Torque: 44 pound-inch.
   6. Run time: 150 seconds for 90-degree rotation.
   7. Basis of Design: Belimo model LM24A-V.

C. Sound Ratings: Not to exceed 30 NC at 1.0 inch static pressure based on tests conducted in accordance with ARI Standard 880-98.

D. Temperature sensors and combination temperature and CO2 sensors: Refer to Section 23 09 00.

E. Sequence of Operation: Refer to Section 23 09 93.

PART 3 EXECUTION

3.01 INSTALLATION

A. Connect to ductwork in accordance with Section 23 31 00.

B. Install ceiling access doors or locate units above easily removable ceiling components.

C. Support units individually from structure. Do not support from adjacent ductwork.

D. Support air terminal units connected by flexible duct independently of flexible duct.

E. Install transition piece to match flexible duct size to inlet or outlet of variable air volume terminal.

F. Install minimum of 5 ft of 1 inch thick lined ductwork downstream of units. Refer to Section 23 31 00.

3.02 ADJUSTING

A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to minimum flow as scheduled.

B. Set units with heating coils for minimum and heating maximum flows as scheduled.

END OF SECTION

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SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Diffusers.
2. Registers
3. Grilles.
4. Gravity Intake Hood.
5. Gravity Relief Hood.
6. Louvers
7. Wire Mesh Grille

B. Related Sections:
1. Section 09 91 00 - Painting.
2. Section 23 05 00 – Common Work Results for HVAC.
3. Section 23 09 00 – Instrumentation and Control for HVAC: Power to VAV diffusers.

1.02 REFERENCES

A. Air Movement and Control Association International, Inc. (AMCA):
1. 500 - Test Methods for Louvers, Dampers, and Shutters.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
1. 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets.

C. Sheet Metal and Air Conditioning Contractors (SMACNA):
1. HVAC Duct Construction Standard - Metal and Flexible.

1.03 SUBMITTALS

A. Refer to Section 01 33 00.

B. Product Data: Submit sizes, finish, and type of mounting. Submit schedule of outlets and inlets showing type, size, location, application, and NC rating ant design flow.

C. Catalog data indicating scheduled performance.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Air Outlets:
1. Outlets to be selected to provide throw and distribution required for their respective location without objectionable drafts.
2. Maximum pressure drop through outlet to be 0.10 inches of water.
3. Unless otherwise noted, outlets to be selected on the basis of maintaining a maximum sound level of NC 30.

B. Test and rate diffuser, register, and grille performance in accordance with ASHRAE 70.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years of experience.

PART 2 PRODUCTS

2.01 RECTANGULAR CEILING DIFFUSERS

A. Manufacturers:
   1. Anemostat Air Products.
   2. E. H Price Company.
   3. Krueger.
   4. Nailor Industries, Inc.
   5. Titus.
   6. Tuttle and Bailey.

B. Type: Square, stamped, diffuser to discharge air in 360-degree pattern with sector baffles where indicated.

C. Frame: Surface mount type. In plaster ceilings, furnish plaster frame and ceiling frame.

D. Fabrication: Aluminum with off white, baked enamel or powder coat finish.

E. Accessories: Radial opposed-blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.02 CEILING SLOT DIFFUSERS

A. Manufacturers:
   1. Anemostat Air Products.
   2. E.H. Price Company.
   3. Krueger.
   4. Nailor Industries, Inc.
   5. Titus.
   6. Tuttle and Bailey.

B. Type: Continuous wide slots as scheduled, with adjustable vanes for left, right or vertical discharge.

C. Fabrication: Steel with off white, baked enamel or powder coat finish.

D. Frame: 1 inch margin with clips for gypsum ceiling mounting and perimeter gasket.

E. Plenum: Integral, galvanized steel, insulated, with round or oval duct inlet.

2.03 VAV DIFFUSER

A. Manufacturers:
   1. Titus (T3 SQ-2).
   2. Acutherm (Therma-Fuser).

B. Description
   1. Thermally controlled, modulating air diffuser.
   2. Wall mounted controller thermostat.
   3. 120 v power connection, transformer and 24 VAC RJ-45 control cable.
   4. Supported from supply duct.

2.04 SUPPLY REGISTERS/GRILLES

A. Manufacturers:
   1. Anemostat Air Products.
   2. E.H. Price Company.
   3. Krueger.
   4. Nailor Industries, Inc.
   5. Titus.
   6. Tuttle and Bailey.

B. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille with double deflection.

C. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

D. Fabrication:
   1. Steel with 20 gauge minimum frames and 22 gauge minimum blades, with off white factory baked enamel finish.
   2. Provide aluminum registers and grilles for use in showers, laundry rooms [and other damp areas]. Off white factory baked enamel or powder coat finish.
   3. Stainless steel with 20 gauge frames and 22 gauge blades, satin finish for wet well.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face. Provide aluminum dampers where they are serving aluminum grilles.

2.05 TRANSFER AND RETURN REGISTERS/GRILLES

A. Manufacturers:
   1. Anemostat Air Products.
   2. E.H. Price Company.
   3. Krueger.
   4. Nailor Industries, Inc.
   5. Titus.
   6. Tuttle and Bailey.

B. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, horizontal face.

C. Frame: 1-1/4 inch margin with countersunk screw mounting.

D. Fabrication:
   1. Steel with 20 gauge minimum frames and 22 gauge minimum blades, with off white factory baked enamel finish.
   2. Provide aluminum registers and grilles for use in showers, laundry rooms [and other damp areas]. Off white factory baked enamel or powder coat finish.
   3. Stainless steel with 20 gauge frames and 22 gauge blades, satin finish for wet well.

2.06 GRAVITY INTAKE HOOD

A. Manufacturers:
   1. Loren Cook Company.
   2. Penn Ventilator.
   3. ACME Engineering and Manufacturing Corp.
   4. Greenheck Corp.
   5. Twin City Fans.

B. Hood: Low silhouette, sectional aluminum arched panels with vertical end panels fully locked into hood end panels.

C. Base: 5 inches high, aluminum.

D. Integral curb cap.

E. Finish: color selected by Architect
   1. Mil
   2. Baked Enamel
   3. Kynar

F. Accessories:
   1. Birdscreen: 1/2 inch by 1/2 inch aluminum mesh.
   2. 24V two position motor operated damper.
   3. Insulated 24 inch high roof curb. 1.5 inch rigid insulation.

2.07 GRAVITY RELIEF HOOD

A. Manufacturers:
   1. Loren Cook Company.
   2. Penn Ventilator.
   3. ACME Engineering and Manufacturing Corp.
   4. Greenheck Corp.
   5. Twin City Fans.

B. Hood: Low silhouette, sectional aluminum arched panels with vertical end panels fully locked into hood end panels.

C. Base: 5 inches high, aluminum.

D. Integral curb cap.

E. Finish: color selected by Architect
   1. Mil
   2. Baked Enamel
   3. Kynar

F. Accessories:
   1. Birdscreen: 1/2 inch by 1/2 inch aluminum mesh.
   2. Barometric relief damper with adjustable counterweight.
   3. Insulated 24 inch high roof curb. 1.5 inch rigid insulation.

2.08 LOUVERS [TYPICALLY SPEC BY ARCHITECT, SECTION 08 91 19]

A. Manufacturers
   1. Acceptable Manufacturers for 6-inch deep Aluminum Wall Louvers
      a. The Airolite Company, Model CB6776.
      b. Arrow United Industries, Model EA-615-D.
      c. Industrial Louvers, Inc., Model 653-XP.
      d. Ruskin Louvers, Inc., Model ELF6375DX.
      e. Pottorff
      f. American Warming and Ventilating, A Mestek Company, Model LE-31.
      g. Or approved equal.
   2. Acceptable Manufacturers for 12-inch deep Aluminum Wall Louvers
      a. Greenheck, Model AFJ-120.
      b. Or approved equal.

B. Materials
   1. Aluminum: Comply with the following:
      a. Aluminum Shapes: Extruded aluminum, ASTM B221.
      b. Sheet Aluminum: ASTM B209.
   2. Finish: color selected by Architect
      a. Mil
      b. Baked Enamel
      c. Kynar

C. Continuous Type Wall Louvers – Drainable Blades
   1. 6 Inch Drainable Blade Wall Louver: Aluminum of continuous type design. Construct of not less than 0.081 inch thick extruded aluminum for frame and blades. 6-inch depth with channel shaped frame. Blades at 35-degree slope.
   2. Performance Requirements: Based on 4 foot by 4 foot size unit.
      a. Approximate Free Area: 9.10 square feet (57 percent).
      b. Approximate Pressure Drop, Free Area Velocity at 0.18 Inch Water Gauge: 1,250 fpm.
      c. Approximate Water Penetration, 0.01 Ounce per Square Foot of Free Area: 1,250 fpm.

D. Acoustical Louver
   1. 12 Inch Acoustical Weather Louver: Aluminum of continuous type design. Construct of not less than 0.080 inch thick extruded aluminum for frame and blades. Blades at 45-degree slope.
      a. Performance Requirements: Based on 4 foot by 4 foot size unit.
         1) Approximate Free Area: 3.67 square feet (23 percent).
         2) Approximate Pressure Drop, Free Area Velocity at 0.18 Inch Water Gauge: 961 fpm.
         3) Approximate Water Penetration, 0.01 Ounce per Square Foot of Free Area: 961 fpm.

2.09 WIRE MESH GRILLE

A. Fabricate grille with 2 by 2 mesh 13 mm (1/2 inch) galvanized steel or aluminum hardware cloth in a spot welded galvanized steel frame with approximately 40 mm (1-1/2 inch) margin.

B. Use grilles where shown in unfinished areas such as mechanical rooms and maintenance area exhaust.

PART 3 EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 30 00.

3.02 INSTALLATION

A. Paint visible portion of ductwork behind air outlets and inlets matte black.

B. Install diffusers to ductwork with airtight connection.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

END OF SECTION

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SECTION 23 51 23

GAS VENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Type B Double wall gas vents.
2. Gas vents for condensing type appliances.

B. Related Sections:
1. Section 22 34 00 - Fuel-Fired Domestic Water Heaters.
2. Section 23 05 00 - Common Work Results for HVAC.
3. Section 23 52 00 - Heating Boilers.
4. Section 23 55 23 - Gas-Fired Radiant Heaters.

1.02 REFERENCES

A. American National Standards Institute (ANSI):
1. Z21.66 - Automatic Vent Damper Devices for Use with Gas-Fired Appliances.
2. Z21.67 - Mechanically Actuated Automatic Vent Damper Device.
3. Z21.68 - Thermatically Actuated Automatic Vent Damper Devices.

B. ASTM International (ASTM):
1. A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, Strip.
2. A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
3. A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. A924/A924M – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
5. A1011/A1011M-07 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.

C. National Fire Protection Association (NFPA):
1. 54 - National Fuel Gas Code.
2. 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances.

D. Sheet Metal and Air Conditioning Contractors (SMACNA):
1. Guide for Steel Stack Construction.
2. HVAC Duct Construction Standard - Metal and Flexible.

E. Underwriters Laboratories Inc. (UL):
1. 103 - Factory-Built Chimneys for Residential Type and Building Heating Appliances.
2. 378 - Draft Equipment.
3. 441 - Gas Vents.
4. 641 - Type L Low-Temperature Venting Systems.

5. 959 - Medium Heat Appliance Factory Built Chimneys.

1.03 DEFINITIONS

A. Breeching: Vent Connector.

B. Chimney: Primarily vertical shaft enclosing at least one vent for conducting flue gases outdoors.

C. Smoke Pipe: Round, single wall vent connector.

D. Vent: Portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.

E. Vent Connector: Part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and may include a draft control device.

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Product Data: Submit data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.

1.05 QUALITY ASSURANCE

A. Provide factory built vents and chimneys used for venting natural draft appliances complying with NFPA 211 and UL listed and labeled.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3-years experience.

B. Installer: Company specializing in performing Work of this Section with minimum 3-years documented experience.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Refer to Section 01 60 00.

B. Maintain water integrity of roof during and after installation of chimney or vent.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.09 WARRANTY

A. Refer to Section 01 70 00.

PART 2 PRODUCTS

2.01 REQUIREMENTS:

A. Vent pipe approved for a Category IV appliance is required between the condensing equipment and the terminus.

2.02 TYPE B DOUBLE WALL GAS VENTS

A. Manufacturers:
   1. American Metal Products.
   2. Metal-Fab, Inc.
   3. Selkirk Metalbestos.

B. Fabrication: Inner pipe of sheet aluminum, outer pipe of galvanized sheet steel, tested in compliance with UL 441.

C. Vent Dampers:
   1. Barometric damper: steel damper and housing with galvanized-steel breeching connection. Adjustable counterweight with lock. Include knife-edge bearings that do not require lubrication.
   2. Motorized damper: Electrically actuated, same size as draft hood collar, constructed of stainless steel or galvanized steel, with corrosion resistant components, in compliance with ANSI Z21.66.
      a. Control transformer.
      b. Keyed wiring harness.
      c. Damper end switch to prove damper is open.
      d. Interlock with boiler to permit burner operation when damper is open.
      e. Hold-open switch for troubleshooting boiler controls.

2.03 CONDENSING APPLIANCE GAS VENTS

A. Manufacturers:
   1. American Metal Products.
   2. Metal-Fab, Inc.
   3. Selkirk Metalbestos.
   4. As recommended by appliance manufacturer.

B. Fabrication: UL-1738, [Single wall][Double wall][Double wall, insulated] stainless steel vent pipe specifically designed for use with condensing gas-fired appliances. Approved for use by the appliance manufacturer and installed in accordance with appliance manufacturer requirements regarding length, number of elbows allowed, termination methods and accessories and relationship to appliance combustion air piping.

C. Vent Dampers: Provide only if suitable for operation on selected appliances.

2.04 PVC GAS VENTS

A. PVC Pipe: Solid core, Schedule 40, ASTM D 1785 and ASTM D2665 with fusion or solvent cement.
   1. Fittings: PVC, ASTM F1866.
   2. Joints: Solvent weld with ASTM D2564 solvent cement.

3. Provide contrasting color primer for solvent weld joints.

2.05

2.06 CONDENSATE NEUTRALIZING TRAP

PART 3 EXECUTION

3.01 INSTALLATION

A. Combustion air intakes shall be galvanized steel or schedule 40 PVC with solvent weld fittings.

B. Support horizontal gas vents in accordance with manufacturer's instructions.

C. Install vertical gas vents with suitable means for drainage of condensate.

D. Support breeching from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breeching, chimneys, and stacks at 12 foot spacing, to adjacent structural surfaces, or at floor penetrations. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for equivalent duct support configuration and size.

E. Pitch breeching with positive slope up from fuel-fired equipment to chimney or stack.

F. Coordinate installation of dampers, and induced draft fans.

G. For Type B double wall gas vents, maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories for complete installation.

H. Install vent dampers, locating close to draft hood collar, and secured to breeching.

I. Level and plumb chimney and stacks.

J. Clean breeching, chimneys, and stacks during installation, removing dust and debris.

K. Install slip joints allowing removal of appliances without removal or dismantling of breeching, breeching insulation, chimneys, or stacks.

L. Provide Type B chimney continuously from appliances.

M. Extend vent above roof in accordance with applicable code.

N. Maximum Vent Horizontal Distance: 75 percent of vent vertical distance.

O. Where appliance requires draft hood or barometric control device, install manufacturer furnished listed devices in accordance with manufacturer's instructions and applicable code.

END OF SECTION

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SECTION 23 55 23

GAS-FIRED RADIANT HEATERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Low intensity radiant tube heaters.

B. Related Sections:
1. Section 23 05 29 - Hangers and Supports for Mechanical Piping and Equipment.
2. Section 23 09 00 - Instrumentation and Control for HVAC.
3. Section 23 09 93 – Sequence of Operations for HVAC Controls.
4. Section 23 11 23 - Facility Natural-Gas Piping.
5. Section 23 33 00 - Air Duct Accessories.
6. Division 26 – Electrical: wiring requirements.

1.02 REFERENCES

A. American National Standards Institute (ANSI):
1. Z83.8 - Gas Unit Heaters.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
1. 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

C. International Code Council (ICC):
1. International Building Code (IBC).
2. International Fuel Gas Code (IFGC).
3. International Mechanical Code (IMC).

1.03 SUBMITTALS

A. Refer to Section 01 33 00.

B. Shop Drawings: Indicate assembly, required clearances, and locations and sizes of field connections.

C. Product Data: Submit manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

1.04 CLOSEOUT SUBMITTALS

A. Refer to Section 01 70 00.

B. Project Record Documents: Record actual locations of thermostats or other products not mounted on unit.

C. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing.

1.05 QUALITY ASSURANCE

A. Gas-Fired Radiant Heater Performance Requirements: Conform to minimum efficiency prescribed by ASHRAE 90.1 when tested in accordance with ANSI Z83.8.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3-years experience.

B. Installer: Company specializing in performing Work of this Section with minimum 3-years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 01 60 00.

B. Accept heaters and controls on site in factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 LOW INTENSITY RADIANT TUBE HEATERS

A. Manufacturer:
1. Roberts-Gordon, Model CTH2-40.
2. Superior, Model UX.

B. Description:
1. Low intensity gas infrared heaters in linear or U-tube configurations.
2. Single or two stage gas burner.
3. Tubing: 4 inch diameter 16 gauge aluminized steel pipe.
4. Reflector: Aluminum or stainless steel.
5. Controls:
   a. Hot surface electronic ignition control - four-try.
   b. 100 percent gas shut-off.
   c. Pre-purge, post-purge, auto reset.
   d. Status lights, fault indicator.
6. Direct connect combustion air fitting at burner box.
7. 120V 1.3 A operating current, 4.8 A starting current.

PART 3 EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 30 00.

B. Verify space is ready for installation of units and openings are as indicated on shop drawings.

3.02 INSTALLATION

A. Install units in accordance with the IMC and NFGC.

B. Support units with metal chain following manufacturer's recommendations.

C. Install at overhead garage door height if not indicated otherwise.

D. Seal radiant tube joints liquid tight.

E. Natural Gas Piping:
   1. Provide gas regulator for applications using 2 PSI building service gas pressure.
   2. Connect natural gas piping to unit, full size of unit gas train inlet.
   3. Provide shut-off valve upstream of dirt leg, regulator and union.
   4. Arrange piping with clearances for burner service.

F. Install vents and stacks. Refer to Section 23 51 00.

G. Where applicable, install combustion air/vent kit including concentric adapter in accordance with manufacturer's instructions.

H. Provide operating controls. Refer to Section 23 09 00 for sequence of operation.
   1. Furnish controls contractor with field wiring diagram.

I. Connect to electrical power. Refer to Division 26 for wiring requirements.
   1. Furnish Division 26 Contractor with field wiring diagram and electrical data.

3.03 TESTING AND COMMISSIONING

A. Provide equipment check, test, and commissioning by factory trained and authorized service technician.
   1. This function must be performed by factory authorized personnel, not by the installing contractor, unless factory certified personnel are employed by the installing contractor.
   2. Provide a copy of the start-up report to the Engineer.

END OF SECTION

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SECTION 23 62 00

PACKAGED COMPRESSOR AND CONDENSER UNITS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Air Cooled Condensing Units.

B. Related Sections:
   1. Section 07 53 23 EPDM Roofing: Placement of condensing unit supports on the roof.
   2. Section 23 05 00 – Common work results for HVAC; administrative procedures, installation requirements.
   3. Section 23 09 93 - Sequence of Operations for HVAC Controls: Start-stop sequences.
   4. Section 23 23 00 - Refrigeration Piping: Requirements for refrigerant piping connecting to equipment specified by this section.

1.02 REFERENCES

A. American Bearing Manufacturers Association:
   1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. Air-Conditioning and Refrigeration Institute:
   1. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
   2. ARI 365 - Commercial and Industrial Unitary Air-Conditioning Condensing Units.

C. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
   1. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
   2. ASHRAE 20 - Method of Testing for Rating Remote Mechanical-Draft Air-Cooled Refrigerant Condensers.
   3. ASHRAE 23 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units.
   4. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

D. National Electrical Manufacturers Association:
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. Underwriters Laboratories Inc.:
   1. UL 207 - Refrigerant-Containing Components and Accessories, Nonelectrical.

1.03 DEFINITIONS

A. Coefficient of Performance (COP) - cooling: The ratio of the rate of heat removal to the rate of energy input, in consistent units, for a complete refrigerating system or some specific portion of that system under designated operating conditions.

B. Integrated Part-Load Value (IPLV): A single-number figure of merit based on part-load EER, COP, or kW/ton expressing part-load efficiency for air-conditioning and heat pump

equipment on the basis of weighted operation at various load capacities for the equipment.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit rated capacities, weights, accessories, electrical nameplate data and wiring diagrams.

C. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

D. Field Reports: Submit start-up report indicating results of testing, dehydration, and starting of machine.

1.05 CLOSEOUT SUBMITTALS

A. Section 01 77 00 Contract Closeout: Closeout procedures.

B. Operation and Maintenance Data: Submit maintenance instructions, parts lists, description of controls and accessories.

1.06 QUALITY ASSURANCE

A. Performance Ratings: Coefficient of Performance (COP) and Integrated Part-Load Value (IPLV) not less than prescribed by ASHRAE 90.1.

B. Construction and Ratings: In accordance with [ARI 210/240] [ARI 365] [UL 207]. Testing in accordance with ASHRAE 20.

C. Performance Ratings: Energy Efficiency Ratio (EER) not less than prescribed by ASHRAE 90.1 when tested in accordance with [ARI 210/240] [ARI 365].

1.07 WARRANTY

A. Section 01 77 00 - Contract Closeout: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for compressors.

PART 2 PRODUCTS

2.01 AIR COOLED CONDENSING UNITS

A. Manufacturers:
1. Aaon.
2. Carrier.
3. McQuay.
4. Trane.
5. York.

B. Description:

1. Packaged, factory assembled, pre-wired unit, suitable for outdoor use consisting of casing, refrigerant compressor(s), condensing coil(s) and fan(s), integral refrigerant piping, fan guards, mounting skids and controls. Provide discharge and liquid connection valves.
2. House components in galvanized steel panels with weather resistant, baked enamel finish.
3. Mount starters, disconnects, and controls in weatherproof panel with full opening access doors. Furnish mechanical interlock to disconnect power when door is opened.
4. Furnish removable access doors or panels with quick fasteners.
5. Label components including pipe stub outs, refrigeration system components and electrical and controls components.
6. Provide laminated color coded wiring diagram inside the control compartment door.

C. Construction:
1. Unit shall be completely factory assembled, piped, wired and shipped in one section.
2. Designed for outdoor application.
3. Condenser coils: Mechanically protected from physical damage by painted galvanized steel louvers (wire grille) covering the full area of the coil.
4. Access to condenser coils, condenser fans, compressors, and electrical and controls components: Hinged access doors with quarter turn, zinc cast, lockable handles.
5. Paint finish: Capable of withstanding at least 1,000 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
6. Lockable hinged access doors provide access to the compressors.
7. Include forklift slots in unit base.

D. Electrical:
1. Provided with standard power block for connecting power to the unit.
2. Control circuit transformer and wiring: Provides 24 VAC control voltage from the line voltage provided to the unit.
3. Equip each compressor with a 5 minute off, delay timer to prevent compressor short cycling.

E. Refrigeration System:
1. Compressors:
   a. Scroll type with thermal overload protection and crankcase heater.
   b. Mounted in an isolated service compartment which can be accessed without affecting unit operation.
   c. Isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators.
   d. Include a 10-100% variable capacity scroll compressor on the lead circuit.
      1) For Manufacturer's lacking this capability, provide hot gas bypass piping and controls to allow stable operating performance at low and part load conditions.
2. Each refrigeration circuit:
   a. Equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides, and service valves for liquid and suction connections.
   b. Provide liquid line filter driers.
3. Include a factory holding charge of R-410A refrigerant and oil.

F. Airside economizer limits system operation to outside temperatures above 50 degrees F.

2.02 CONDENSING UNIT SOUND CONTROL

A. Manufacturers
1. BRD Noise and Vibration Control, Inc
2. Condenser Manufacturer's OEM Acoustical Package
3. Approved Equal

B. Material
1. Removable Blanket Insulation, Velcro flaps, Finished Surface Mass – 3 lbs. per sq. ft., to cover compressors only for the specified condenser. Complete 100% coverage is required.
2. Removable Sound Covers shall be constructed with a Silicone-fiberglass cloth outer jacket, a loaded vinyl barrier septum, fiberglass needle mat (11 lbs./ft.3 density), and a Silicone-fiberglass cloth inner jacket. The covers shall be connected together by means of cloth straps with "D" rings and Velcro fasteners. The inner and outer jackets shall protect against UV rays, oil and water. Stainless steel wire tie fastening assemblies are not acceptable.
3. Basis of Design: BRD "HUSHCORE STANDARD SL" system

C. Accoustical Performance
1. The acoustical jackets shall have insertion loss across the frequency levels as listed below in accordance with ASTME1222 Standard Test Method for Laboratory Measurement of the Insertion Loss of Pipe Lagging Systems.

315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
4	4	9	15	12	19	22	23	26	28	27	30	30

2. When operating at worst case noise conditions, the chiller with prescribed noise treatments shall not exceed [50] dBA at a distance of [50 ft/ property line].
3. Acoustical readings shall be provided by the condenser manufacturer after completed installation. Readings shall be conducted by a qualified acoustical consultant.

D.

PART 3 EXECUTION

3.01 UNIT INSTALLATION

A. Placement:
1. Follow manufacturer's recommendations for rigging, protecting, lifting and placing condensing units when received on site.

B. Electrical: Locate wiring diagram for Division 26 contractor to follow for making connections.

C. Roof Mounted:

D. Ground Mounted: Install ground mounted units on concrete pad at least 3-1/2 inches high and 6 inches wider than unit.

3.02 PIPING INSTALLATION

A. Install refrigerant suction piping from evaporator coil to compressor inlet.

B. Install compressor hot gas discharge piping to suction piping located at evaporator coil. Provide back-pressure regulator and modulating hot gas control valve to maintain stable refrigerant flow conditions.

C. Install liquid line between condenser coil and direct expansion evaporator coil. Provide liquid line solenoid valve and thermal expansion valve. Extend remote bulb sensor for TXV to suction piping and mount as recommended by condensing unit manufacturer. [Locate bulb upstream of hot gas connection].

D. Refrigerant piping:
   1. Finished field installed refrigerant circuits shall include the low side cooling components, refrigerant, thermal expansion valve, liquid line and insulated suction line.
      a. Provide insulated hot gas bypass line, valves and control for systems lacking variable speed compressor.

3.03 EQUIPMENT START-UP

A. Perform system checks in accordance with Commissioning Authority and manufacturer's published start-up procedures prior to start-up.

B. Charge piping system to capacity after refrigerant piping has been leak tested.

C. Operate system though various conditions to insure controls and safety features are functioning properly.

3.04 TRAINING

A. Provide Owner with 4 hours minimum factory training for the condensing unit:
   1. Include the following topics:
      a. Safety features and lockout controls.
      b. Normal operating conditions and limits.
      c. Start-up and shut-down procedures.
      d. Coil and other component cleaning.
      e. Sight glass conditions and other indicators.
   2. Obtain certification from Owners personnel that training has occurred.

3.05 PROJECT CLOSEOUT

A. Furnish Owner with Operation and Maintenance manuals describing system operation and contact information for installing Contractor.

B. Provide Owner with five year warranty for compressors.

END OF SECTION

SECTION 23 74 00

PACKAGED OUTDOOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Packaged rooftop air conditioning unit.
   2. Roof curb.

B. Related Sections:
   1. Section 23 09 93 - Sequence of Operations for HVAC Controls: Sequences of operation applying to units in this section.
   2. Section 23 11 23 - Facility Natural-Gas Piping: Natural gas piping connections.
   3. Section 23 33 00 - Air Duct Accessories: Flexible connections.
   4. Section 26 05 03 - Equipment Wiring Connections: Electrical connection to units.
   5. Section [_____] - [_____]: Roof curbs.
   6. Section [_____] - [_____]: Roof curb flashing.

1.02 REFERENCES

A. Air-Conditioning and Refrigeration Institute:
   1. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
   2. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
   3. ARI 340/360 - Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.

B. Air Movement and Control Association International, Inc.:
   1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

C. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
   1. ASHRAE 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
   2. ASHRAE 62 - Ventilation for Acceptable Indoor Air Quality.
   3. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

D. ASTM International:
   1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

E. National Fire Protection Association:
   1. NFPA 54 - National Fuel Gas Code.
   2. NFPA 58 - Liquefied Petroleum Gas Code.
   3. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data indicating:

1. Cooling and heating capacities.
2. Dimensions.
3. Weights.
4. Rough-in connections and connection requirements.
5. Duct connections.
6. Electrical requirements with electrical characteristics and connection requirements.
7. Controls.
8. Accessories.

C. Test Reports: Submit results of factory test at time of unit shipment.

D. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

F. Manufacturer's Field Reports: Submit start-up report for each unit.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of controls installed remotely from units.

C. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.05 QUALITY ASSURANCE

A. Cooling Capacity: Rate in accordance with [ARI 210/240] [ARI 340/360].

B. Sound Rating: Measure in accordance with ARI 270.

C. Insulation and adhesives: Meet requirements of NFPA 90A.

D. Performance Requirements: Conform to minimum [EER] [SEER] prescribed by ASHRAE 90.1 when tested in accordance with [ARI 210/240] [ARI 340/360].

E. Outside Air Damper Leakage: Test in accordance with AMCA 500.

F. Perform Work in accordance with State of Minnesota standard.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Accept units on site. Inspect for damage.

C. Protect units from damage by storing off roof until roof mounting curbs are in place.

1.08 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate installation of roof curbs with roof structure, roof deck and roof membrane installation.

1.09 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 ROOFTOP AIR CONDITIONING UNITS

A. Manufacturers:
1. Aaon Incorporated.
2. Carrier Corp.
3. Lennox International.
4. McQuay International.
5. Rheem Manufacturing.
6. The Trane Company.
7. York International.
8. Or approved equal.

B. Product Description: Self-contained, packaged, factory assembled and wired, consisting of roof curb, cabinet, supply fan, refrigerant cooling coil, compressor, refrigeration circuit, condenser, gas-fired heating section, [electric heating coil,] [hot water heating coil,] air filters, mixed air casing, controls, and accessories.

C. Configuration: Downflow air delivery.

D. Roof Mounting Curb: [14] [24] [_____] inch high, galvanized steel, channel frame with gaskets, nailer strips. Full perimeter type for mounting under entire unit.

E. Restrained Isolation Roof Curb:
1. Height: [14] [24] [_____] inch
2. Construction: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail designed to resiliently support equipment and to withstand seismic and forces. Galvanized steel, channel frame with gaskets, nailer strips. Full perimeter type for mounting under entire unit.
3. Upper Frame: The upper frame shall provide continuous support for equipment and shall be captive to resiliently resist seismic and wind forces.
4. Lower Support Assembly: The lower support assembly shall be formed sheet metal section containing adjustable and removable steel springs that support the upper

frame. The lower support assembly shall have a means for attaching to building structure and a wood nailer for attaching roof materials, and shall be insulated with a minimum of 2 inches of rigid, glass-fiber insulation on inside of assembly. Adjustable, restrained-spring isolators shall be mounted on elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.

5. Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counter-flashed over roof materials.

****** [OR] ******

F. Roof Mounting Curb: Refer to Section [_____].

G. Coatings: Corrosion Protection Coating capable of withstanding salt spray test of [1000] [_____] hours in accordance with ASTM B117.] Phenolic based coating, applied on surfaces prepared in accordance with coating manufacturer's recommendation, of the following type:
   1. 3 mil total dry thickness, 2 coats, air dried, for exterior surfaces of air handling equipment exposed to temperatures less than 150 degrees F. Applied by equipment manufacturer. Heresite VR-500 Series, color selected by Architect.
   2. 3 mil total dry thickness, four coats, baked on, for surfaces exposed to temperatures over 150 degrees F and on all heat transfer surfaces. Applied by coating manufacturer. Heresite P-413.
   3. 5 mil total dry thickness, 3-4 coats, air dried, for interior surfaces of air handling equipment exposed to temperatures of less than 150 degrees F. Applied by equipment manufacturer. Provide primer-finish combination material, formulated for salt water service, matte finish. Heresite VR-514.

H. Cabinet:
   1. Designed for outdoor installation with weatherproof construction.
      Panels: Constructed of [steel] [galvanized steel] with [baked enamel finish] [see Coatings for finish,] meeting salt spray test in accordance with ASTM B117. Furnish access doors or removable access panels.
   2. Insulation: Factory applied to exposed vertical and horizontal panels. [1/2] [one] [2] inch thick [neoprene coated] [aluminum foil faced] glass fiber with edges protected from erosion.

I. Supply Fan: Forward curved centrifugal type, resiliently mounted with direct drive [high efficiency motor]. Motor permanently lubricated with built-in thermal overload protection.
   1. [See Coatings for finish]

J. Variable Frequency Drive.

K. Evaporator Coil: Constructed of copper tubes expanded onto aluminum fins. Galvanized drain pan with piping connection. Factory leak tested under water. [Furnish coil with corrosion resistant coating capable of withstanding salt spray test of [1000] [_____] hours in accordance with ASTM B117.]
   1. [See Coatings for finish]

L. Compressor: Hermetically sealed, resiliently mounted with positive lubrication, and internal motor overload protection. Furnish [internal vibration isolators,] [external vibration isolators,] [short cycle protection].

M. Refrigeration circuit: [Furnish] [Furnish the following for each circuit] [fixed orifice control] [expansion device,] [thermal expansion valve,] [filter-drier,] [suction, discharge, and liquid line service valves with gauge ports,] [high and low pressure safety controls,] [and] [_____]. Dehydrate and factory charge [each circuit] with oil and refrigerant.

N. Condenser:
1. Coil: Copper tube [aluminum] [copper] fin coil assembly [with subcooling rows] [and coil guard]. Factory leak tested under water. [Furnish coil with corrosion resistant coating capable of withstanding salt spray test of [1000] [_____] hours in accordance with ASTM B117.] [See Coatings for finish]
2. Condenser Fan: Direct drive propeller fans statically and dynamically balanced. Wired to operate with compressor. Motor permanently lubricated with built-in thermal overload protection. [Furnish high efficiency fan motors.]

O. Gas-Fired Heating Section – Direct Fired
1. Fuel: Natural gas.
2. Gas Burner: Midco style burner with fixed baffle air deflector, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device. Automatic 100 percent shut-off pilot. Require unit fan operation before allowing gas valve to open.

P. Gas-Fired Heating Section – Indirect Fired
1. Fuel: Natural gas.
2. Heat Exchangers: [Aluminized] [Stainless], welded construction.
3. Gas Burner: [Atmospheric] [Induced draft] [Forced draft] type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and [automatic 100 percent shut-off pilot]. Require unit fan operation before allowing gas valve to open.

****** [OR] ******

Q. Air Filters: [1] [2] [4] inch [thick glass fiber disposable media in metal frames.] [25 to 30 percent efficiency based on ASHRAE 52.1.]

R. Mixed Air Casing:
1. Outside Air Damper Leakage: Maximum [3.0] [_____] cfm per square foot at [1.0] [_____] inches wg pressure differential.
2. Outside Air Damper: Manual, for fixed outside air quantity. [Furnish rain hood with screen.]

****** [OR] ******

3. Outside Air Damper: Remote controlled with damper operator and remote rheostat for adjusting outside air quantity.

****** [OR] ******

4. Outside Air Damper: Automatic, two position [spring return]. Interlocked to open when supply fan starts. [Outside air damper normally closed and return air damper normally open.] Furnish rain hood with screen.

****** [OR] ******

5. Economizer: [Factory installed] fully modulating motorized outside air and return air dampers controlled by [dry bulb] [enthalpy] [differential enthalpy] controller [with minimum position setting.] [Outside air damper normally closed and return air damper normally open.] [Furnish barometric relief damper capable of closing by gravity.] [Furnish barometric relief damper with powered exhaust.] [Furnish rain hood with screen.] Provide economizer components and controls in accordance with ICC IECC.

S. Controls:
1. Furnish control to provide low ambient cooling to [0] [-20] degrees F.
2. Furnish low limit thermostat in supply air to close outside air damper and stop supply fan.
3. Furnish terminal strip on unit for connection of operating controls to remote panel.
4. Thermostat: Remote space thermostat with [1] [2] stage heating and [1] [2] stage cooling with [manual] [automatic] changeover. Furnish system selector switch [heat-off-cool] [off-heat-auto-cool] [and fan control switch auto-on].

****** [OR] ******

5. Thermostat: [7 day] programmable electronic space thermostat with [1] [2] stage heating and [1] [2] stage cooling with [manual] [automatic] changeover and heating setback and cooling setup capability. Furnish system selector switch [heat-off-cool] [off-heat-auto-cool] [and fan control switch, auto-on].
6. Status Panel: Furnish remote panel containing the following status indications:
   a. [Cooling mode.]
   b. [Heating mode.]
   c. [Compressor 1.]
   d. [Compressor 2.]
   e. [Heating failure.]
   f. [Dirty filters.]

****** [OR] ******

7. Control and Status Panel: Furnish remote panel containing the following control and status indications:
   a. [Cooling mode.]
   b. [Heating mode.]
   c. [Compressor 1.]
   d. [Compressor 2.]
   e. [Heating stage 1.]
   f. [Heating stage 2.]
   g. [Heating failure.]
   h. [Dirty filters.]
   i. [Fan only operation.]
   j. [Manual 12 hour timer to override night control.]
   k. [7 day time clock for energizing night control.]
   l. [Remote damper control.]
   m. [Low limit manual reset.]
   n. [Remote thermostat temperature set point.]
   o. [_____.]
8. Furnish interface to [Building Automation and Control System] [Direct Digital Control System] specified in Section [25 50 00 {13800}] [23 09 23 {15910}].
9. Microprocessor Based Controls:
   a. [Factory mounted] [Field installed] with the following features:

1) Monitor each mode of operation.
2) Evaporator fan status.
3) Filter status.
4) Indoor air quality.
5) Supply air temperature.
6) Outdoor air temperature.

b. Diagnostics for [thermostat] [temperature sensor] commands for staged heating, staged cooling, fan operation, and economizer operation.
c. Zone space temperature sensor to interface with microprocessor controls with [Manual] [Automatic] programmable with night setback.

T. Accessories:
1. Convenience Outlet: Factory installed, 115 volt, 15 amp, GFCI type, internally mounted.
2. Roof Curb Adaptor Package: Furnish duct support hardware to adapt unit to existing roof curb.
3. [Factory] [Field] installed ultraviolet C light located downstream of cooling coil.

U. Capacity: As indicated on Drawing Schedules.

2.02 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics: As indicated on Drawing Schedules.

B. Disconnect Switch: Factory mounted, non-fused.

C. Disconnect Switch: As indicated on Drawing Schedules.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify roof curbs are installed and dimensions are as shown on shop drawings and instructed by manufacturer.

3.02 PREPARATION

A. Furnish roof curbs to Section [_____] for installation.

3.03 INSTALLATION

A. Roof Curb:
1. Assemble roof curb.
2. Install roof curb level.
3. Coordinate curb installation and flashing with Section [_____].
4. Install units on roof curb providing watertight enclosure to protect ductwork and utility services.
5. Install gasket material between unit base and roof curb.

B. Ground Mounted: Install ground mounted units on concrete pad at least 3-1/2 inches high and 12 inches wider than unit on each side.

C. Install units on vibration isolators.

D. Connect units to supply and return ductwork with flexible connections. Refer to Section 23 33 00.

E. Install condensate piping with trap and route from drain pan to splash block on roof. Refer to Section 23 21 13.

F. Install components furnished loose for field mounting.

G. Install electrical devices furnished loose for field mounting.

H. Install control wiring between unit and field installed accessories.

I. Remove from roof and dispose off-site panels removed from units during installation of economizer and dampers.

3.04 INSTALLATION - NATURAL GAS HEATING SECTION

A. Connect natural gas piping in accordance with NFPA 54.

B. Connect natural gas piping to unit, full size of unit gas train inlet. Arrange piping with clearances for burner service.

C. Install the following piping accessories on natural gas piping connections. Refer to Section 23 11 23.
1. Strainer.
2. Pressure gage.
3. Shutoff valve.
4. Pressure reducing valve.

D. Install natural gas piping accessories above roof.

3.05 MANUFACTURER'S FIELD SERVICES

A. Section 01 40 00 - Quality Requirements: Requirements for manufacturer's field services.

B. Furnish initial start-up and shutdown during first year of operation, including routine servicing and checkout.

3.06 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Vacuum clean coils and inside of unit cabinet.

C. Install new throwaway filters in units at Substantial Completion.

3.07 DEMONSTRATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate unit operation and maintenance.

3.08 SCHEDULES

A. Schedules as shown on Drawings.

END OF SECTION

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SECTION 23 81 26

SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Air handling unit.
2. Condensing unit.
3. Condensate pump.
4. Security cage.

B. Related Sections:
1. Section 23 05 00 - Common Work Results for HVAC.
2. Section 23 09 93 - Sequence of Operations for HVAC Controls.
3. Section 26 05 03 - Equipment Wiring Connections

1.02 REFERENCES

A. Air-Conditioning and Refrigeration Institute (ARI):
1. 270 - Sound Rating of Outdoor Unitary Equipment.
2. 365 - Commercial and Industrial Unitary Air-Conditioning Condensing Units.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
1. 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
2. 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

C. ASTM International (ASTM):
1. B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

D. National Electrical Manufacturers Association (NEMA):
1. MG 1 - Motors and Generators.

E. National Fire Protection Association (NFPA):
1. 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

1.03 SUBMITTALS

A. Refer to Section 01 33 00.

B. Product Data: Submit data indicating:
1. Cooling and heating capacities.
2. Dimensions.
3. Weights.
4. Rough-in connections and connection requirements.
5. Electrical requirements with electrical characteristics and connection requirements.
6. Controls.
7. Accessories.

C. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

D. Manufacturer's Field Reports: Submit start-up report for each unit.

1.04 CLOSEOUT SUBMITTALS

A. Refer to Section 01 70 00.

B. Project Record Documents: Record actual locations of controls installed remotely from units.

C. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.05 QUALITY ASSURANCE

A. Performance Requirements: Energy Efficiency Rating (EER) not less than prescribed by ASHRAE 90.1 when used in combination with compressors and evaporator coils when tested in accordance with ACHRI 210/240.

B. Cooling Capacity: Rate in accordance with ARI 365.

C. Sound Rating: Measure in accordance with ARI 270.

D. Insulation and adhesives: Meet requirements of NFPA 90A.

E. Perform Work in accordance with State of Minnesota standard.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3-years experience.

B. Installer: Company specializing in performing work of this section with minimum 3-years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 01 60 00.

B. Accept units and components on site in factory protective containers, with factory shipping skids and lifting lugs. Inspect for damage.

C. Comply with manufacturer's installation instruction for rigging, unloading and transporting units.

D. Protect units from weather and construction traffic by storing in dry, roofed location.

1.08 COORDINATION

A. Refer to Section 01 30 00.

B. Coordinate installation of condensing units with concrete pad.

1.09 WARRANTY

A. Refer to Section 01 70 00.

B. Furnish five year manufacturers warranty for compressors.

1.10 MAINTENANCE MATERIALS

A. Refer to Section 01 70 00.

PART 2 PRODUCTS

2.01 SPLIT SYSTEM AIR CONDITIONING UNITS

A. Manufacturers:
1. Carrier Corp.
2. Lennox International.
3. McQuay International.
4. Mitsubishi Electric.
5. Rheem Manufacturing.
6. Samsung HVAC America.
7. The Trane Company.
8. York International.
9. Or approved equal.

B. Product Description: Split system consisting of indoor unit and condensing unit including cabinet, evaporator fan, refrigerant cooling coil, compressor, refrigeration circuit, condenser, air filters, controls, air handling unit accessories, condensing unit accessories, and refrigeration specialties.

2.02 INDOOR UNIT

A. Configuration: Horizontal air delivery.

B. Cabinet [steel]:
1. Panels: Constructed of galvanized steel with baked enamel finish. Access Panels: Located on both sides of unit. Furnish with duct collars on inlets and outlets.
2. Insulation: Factory applied to each surface to insulate entire cabinet. 1/2 inch thick neoprene coated or aluminum foil faced glass fiber with edges protected from erosion.

C. Cabinet [plastic]:

D. Evaporator Fan: Forward curved centrifugal type, resiliently mounted with direct drive motor. Motor permanently lubricated with built-in thermal overload protection.

E. Evaporator Coil: Constructed of copper tubes expanded onto aluminum fins. Factory leak tested under water. Removable, PVC construction, double-sloped drain pan with piping connections on both sides.

F. Refrigeration System: Single refrigeration circuits controlled by factory installed thermal expansion valve.

G. Air Filters: Factory standard glass fiber disposable media in metal frame.

H. Condensate Pump:

I. Air Handling Unit Accessories:
   1. Discharge Louver: Construction and finish matching unit casing. Integral grille.
   2. Return Air Grille: mounted in return air opening, fixed louvers.
   3. Mounting Sub-base with construction and finish matching unit casing.

2.03 CONDENSING UNIT

A. General: Factory assembled and tested air cooled condensing units, consisting of casing, compressors, condensers, coils, condenser fans and motors, and unit controls.

B. Unit Casings: Exposed casing surfaces constructed of galvanized steel with manufacturer's standard baked enamel finish. Designed for outdoor installation and complete with weather protection for components and controls, and complete with removable panels for required access to compressors, controls, condenser fans, motors, and drives.

C. Compressor: Single refrigeration circuit with rotary type compressors, resiliently mounted, with positive lubrication, and internal motor overload protection.

D. Condenser Coil: Constructed of copper tubing mechanically bonded to aluminum fins, factory leak and pressure tested.

E. Controls: Furnish operating and safety controls including high and low pressure cutouts. Control transformer. Furnish magnetic contactors for compressor and condenser fan motors.

F. Condenser Fans and Drives: Direct drive propeller fans statically and dynamically balanced. Wired to operate with compressor. Permanently lubricated ball bearing type motors with built-in thermal overload protection.

G. Condensing Unit Accessories: Furnish the following accessories:
   1. Low ambient kit with manufacturer recommend controls and accessories to provide low ambient cooling to [+40][0]-20 degrees F.
   2. Disconnect switch.
   3. Condenser Coil Guard: Condenser fan openings furnished with PVC coated steel wire safety guards.

H. Refrigeration specialties: Furnish the following:
   1. Charge of compressor oil.
   2. Holding charge of refrigerant.
   3. Replaceable core type filter drier.
   4. Liquid line sight glass and moisture indicator.
   5. Shut-off valves on suction and liquid piping.
   6. Liquid line solenoid valve.
   7. Charging valve.
   8. Crankcase heater.
   9. Pressure relief device.

l. Refrigerant: Furnish charge of refrigerant R410a.

2.04 CONDENSING UNIT SOUND CONTROL

A. Manufacturers
1. BRD Noise and Vibration Control, Inc
2. Condenser Manufacturer's OEM Acoustical Package
3. Approved Equal

B. Material
1. Removable Blanket Insulation, Velcro flaps, Finished Surface Mass – 3 lbs. per sq. ft., to cover compressors only for the specified condenser. Complete 100% coverage is required.
2. Removable Sound Covers shall be constructed with a Silicone-fiberglass cloth outer jacket, a loaded vinyl barrier septum, fiberglass needle mat (11 lbs./ft.3 density), and a Silicone-fiberglass cloth inner jacket. The covers shall be connected together by means of cloth straps with "D" rings and Velcro fasteners. The inner and outer jackets shall protect against UV rays, oil and water. Stainless steel wire tie fastening assemblies are not acceptable.
3. Basis of Design: BRD "HUSHCORE STANDARD SL" system

C. Accoustical Performance
1. The acoustical jackets shall have insertion loss across the frequency levels as listed below in accordance with ASTME1222 Standard Test Method for Laboratory Measurement of the Insertion Loss of Pipe Lagging Systems.

315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
4	4	9	15	12	19	22	23	26	28	27	30	30

2. When operating at worst case noise conditions, the chiller with prescribed noise treatments shall not exceed [50] dBA at a distance of [50 ft/ property line].
3. Acoustical readings shall be provided by the condenser manufacturer after completed installation. Readings shall be conducted by a qualified acoustical consultant.

2.05 REFRIGERANT LINE SET

A. [In lieu of field constructing brazed components and piping as specified in Section 23 05 00 it is acceptable to] install factory furnished pre-charged line sets and accessories to accomplish the work.

B. Insulate the refrigerant suction piping with 1/2 inch thick elastomeric foam insulation. Paint insulation exposed to weather with alkydchorinated - rubber paint. [Insulate the refrigerant piping as specified in Section 23 07 00 HVAC Insulation.]

2.06 CONTROLS

A. Thermostat: Remote [hard-wired] [wireless] space thermostat with single stage cooling. Furnish system selector switch off-cool and fan control switch auto-on.

B. Disconnect Switch: Non-fused type, accessible from outside unit, with power lockout capability.

2.07 CONDENSATE PUMP (FOR 5 TON OR LESS EQUIPMENT)

A. Product:
1. Description: Factory-assembled and -tested, automatic-operation, basin-mounted, sump-pump unit.
2. Pump shall be rated for a maximum temperature of 140 degrees F.
3. Reservior: [cast aluminum][polyethelyne][plastic]
4. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection.
5. Power Cord: Three-conductor, waterproof cable of length required but not less than 72 inches, with grounding plug and cable-sealing assembly for connection at pump.
6. Control:
   a. Motor-mounted float switch.
   b. Auxiliary high-level switch.
7. Performance:
   a. 45 gallons per hour at 10 feet head.
   b. Shut Off Head: 20 feet.
8. [Listing: UL 2043 for plenum applications]
9. Electrical: 115 V
10. Basis of Design: Little Giant VCC-20-P series[plenum rated, hard wired]
11. Basis of Design: Little Giant VCMA-20 series[not plenum rated, cord & plug]

2.08 AIR CONDITIONER CAGE

A. Manufacturers
1. AC Guard
2. Property Armor
3. Safe Guard A/C

B. Product
1. Frame: one inch, 16 gauge tubular steel
2. Panels: ¾ - #9 expanded metal sheet, 9 gauge steel, 0.6 inch x 1.5 inch openings, 50 percent minimum open area.
3. Finish: powder coated
4. Trim: removable panels with welded hasp and eye for padlocks. Welded feet predrilled for anchor bolts.
5. Basis of Design: AC-Guard model ACMS

PART 3 EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 30 00.

3.02 INSTALLATION - AIR HANDLING UNIT

A. Mount indoor unit on resilient vibration isolators.

B. Install condensate piping with trap and route from drain pan to condensate drainage system.

C. Install components furnished loose for field mounting.

D. Install connection to electrical power wiring in accordance with Section 26 05 03.

E.

3.03 INSTALLATION - CONDENSING UNIT

A. Install condensing units on concrete pads [treated wood blocks][24" high metal stands][wall hangers] and vibration isolators.

B. Install outdoor equipment inside lockable enclosure. Secure enclosure to concrete pad [wall] with anchor bolts.

C. Install refrigerant piping from unit to condensing unit. Install refrigerant specialties furnished with unit.

D. Evacuate refrigerant piping and install initial charge of refrigerant.

E. [Insulate the refrigerant piping as specified in Section 23 07 00 HVAC Insulation.]

F. Insulate the refrigerant suction piping with 1/2 inch thick elastomeric foam insulation. Paint insulation exposed to weather with alkydchorinated - rubber paint.

G. Install electrical devices furnished loose for field mounting.

H. Install control wiring between air handling unit, condensing unit, and field installed accessories.

I. Install connection to electrical power wiring in accordance with Section 26 05 03.

3.04 INSTALLATION – CONDENSATE PUMP

A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

B. Plumbing Connections:
   1. Connect a suitable drain line from the evaporator coil drain to the pump's inlet. Ensure a downward slope of the line in order to provide proper gravity drainage into the pump.
   2. Connect the properly sized discharge line to the discharge port's check valve assembly. Do not run piping higher than 80% of the recommended lift for the pump. For proper drainage of the discharge line, any horizontal run should have a downward slope.

C. Install connection to electrical power wiring in accordance with Section 26 05 03.

3.05 MANUFACTURER'S FIELD SERVICES

A. Refer to Section 01 40 00.

B. Furnish initial start-up and shutdown during first year of operation, including routine servicing and checkout.

3.06 CLEANING

A. Refer to Section 01 70 00.

B. Vacuum clean coils and inside of unit cabinet.

C. Install new throwaway filters in units at Substantial Completion.

END OF SECTION

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SECTION 23 82 39

UNIT HEATERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Unit heaters.
2. Cabinet unit heaters.
3. Hydronic radiant heaters.
4. Electric radiant heaters.
5. Gas fired unit heaters

B. Related Sections:
1. Section 23 07 00 - HVAC Insulation.
2. Section 23 31 00 - HVAC Ducts and Casings.
3. Section 26 05 03 - Equipment Wiring Connections.

1.02 REFERENCES

A. Air-Conditioning and Refrigeration Institute (ARI):
1. 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

B. Sheet Metal and Air Conditioning Contractors (SMACNA):
1. - HVAC Duct Construction Standard - Metal and Flexible.

1.03 SUBMITTALS

A. Refer to Section 01 33 00.

B. Shop Drawings: Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations. Indicate schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers.

C. Product Data: Submit coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions. Submit mechanical and electrical service locations, capacities and accessories or optional items.

D. Manufacturer's Installation Instructions: Submit assembly, support details, and connection requirements.

1.04 CLOSEOUT SUBMITTALS

A. Refer to Section 01 70 00.

B. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access to valves.

C. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3-years experience.

B. Installer: Company specializing in performing Work of this Section with minimum 3-years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 01 60 00.

B. Accept units on site in factory packing. Inspect for damage. Store under roof.

C. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.07 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 STEAM/HYDRONIC UNIT HEATERS

A. Acceptable Manufacturers:
1. Markel.
2. McQuay.
3. Rittling.
4. Trane.

B. Coils: Seamless copper tubing, 0.025 inch minimum wall thickness, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

C. Casing: 0.0478-inch thick steel with threaded pipe connections for hanger rods.

D. Finish: Factory applied baked enamel of color as selected.

E. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

F. Air Outlet: Adjustable pattern diffuser on projection models and 2-way louvers on horizontal throw models.

G. Motor: Permanently lubricated sleeve bearings on horizontal models, grease lubricated ball bearings on vertical models. Refer to Section 23 05 13.

H. Control: DDC activated from local temperature sensor signal.

I. Capacity: As scheduled, based on 65 degrees F entering air temperature.

2.02 CABINET UNIT HEATERS

A. Acceptable Manufacturers:
   1. Markel.
   2. McQuay.
   3. Rittling.
   4. Trane.

B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 100 psi and 220 degrees F.

C. Cabinet: 0.0598 inch thick steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation [and integral air outlet] [and integral air outlet and inlet grilles].

D. Finish: Factory applied baked enamel, of color as selected, on visible surfaces of enclosure or cabinet.

E. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

F. Motor: Tap wound multiple speed [permanent split capacitor] [shaded pole] with sleeve bearings, resiliently mounted.

G. Control: Multiple speed switch, factory wired, located in cabinet.

H. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.

I. Mixing Dampers: Where indicated, mixing sections with dampers.

J. Capacity: As Scheduled, based on 65 degrees F entering air temperature.

2.03 GAS FIRED UNIT HEATERS

A. Acceptable Manufacturers:
   1. Modine
   2. Reznor
   3. Approved Equal.

B. Description: Factory assembled, piped, and wired, and complying with ANSI Z83.8/CSA 2.6.

C. Gas Type: Design burner for [natural] [propane] gas having characteristics same as those of gas available at Project site.

D. Type of Venting: [Gravity] [Powered] [Indoor, separated combustion, power] vented.

E. Housing: Steel, with integral draft hood and inserts for suspension mounting rods.
   1. External Casings and Cabinets: [Baked enamel] [Powder coating] over corrosion-resistant-treated surface.

2. Discharge Louvers: Independently adjustable, [horizontal] [vertical] blades.
3. Discharge Nozzle: Discharge at [25 to 65 degrees (0.44 to 1.13 radians)] [50 to 90 degrees (0.87 to 1.57 radians)] from horizontal.

F. Accessories:
1. Four-point suspension kit.
2. Power Venter: Centrifugal aluminized-steel fan, with stainless-steel shaft; 120-V ac motor.
3. Concentric, Terminal Vent Assembly: Combined combustion-air inlet and power-vent outlet with wall or roof caps. Include adapter assembly for connection to inlet and outlet pipes, and flashing for wall or roof penetration.

G. Heat Exchanger: [Aluminized] [Stainless] steel.

H. Burner Material: [Aluminized steel with stainless-steel inserts] [Stainless steel].

I. Controls: Regulated redundant gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.
1. Gas Control Valve: [Single stage] [Two stage] [Modulating].
2. Ignition: [Standing pilot] [Electronically controlled electric spark with flame sensor].
3. Fan Thermal Switch: Operates fan on heat-exchanger temperature.
4. Vent Flow Verification: [Flame rollout switch] [Differential pressure switch to verify open vent].
5. Control transformer.
6. High Limit: Thermal switch or fuse to stop burner.

J. Thermostat: Devices and wiring are specified in Section 230923.27 "Temperature Instruments."

K. [Wall] [Unit]-Mounted Thermostat:
1. [Single] [Two] stage.
2. Fan on-off-automatic switch.
3. 24-V ac.
4. 50 to 90 deg F (10 to 32 deg C) operating range.

L. Electrical Connection: Factory wire motors and controls for a single electrical connection.

2.04 ELECTRIC UNIT HEATERS

A. Refer to Section 23 82 40.

PART 3 EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 30 00.

B. For recessed units, verify recess dimensions are correct size.

C. Verify wall construction is ready for installation.

D. Examine roughing-in for [piping and]electrical connections to verify actual locations before unit-heater installation.

E. Verify ductwork is ready for installation.

F. Verify concealed blocking and supports are in place and connections are correctly located.

3.02 INSTALLATION

A. General Requirements

1. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.
2. Protection: Install finished cabinet units with protective covers during remainder of construction.
3. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.
4. Cabinet Unit Heaters: Install at locations as indicated on Drawings. Coordinate to assure correct recess size for recessed units.
5. Install electrical wiring in accordance with manufacturer's installation instructions and Division 26.

B. Hydronic

1. Install air coils in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible. Refer to Section 23 31 00.
2. Support air coil sections independent of piping on steel channel or double angle frames and secure to casings. Furnish frames for maximum three coil sections. Arrange supports to avoid piercing drain pans. Install with airtight seal between coil and duct or casing.
3. Protect coils to prevent damage to fins and flanges. Comb out bent fins.
4. Install coils level.
5. Make connections to coils with unions and flanges.
6. Install insulation air coil casings. Refer to Section 23 07 00.
7. Insulate headers located outside airflow, insulate as specified for piping. Refer to Section 23 07 00.
8. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.

C. Electric

1. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals and Section 26 05 03.

D. Fuel fired Unit Heaters

1. Install and connect gas-fired unit heaters and associated gas and vent features and systems according to [NFPA 54] [CSA B149.1], applicable local codes and regulations, and manufacturer's written instructions.

2. Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
3. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
4. Where installing piping adjacent to gas-fired unit heater, allow space for service and maintenance.
5. Vent Connections: Comply with Section 235123 - Gas Vents.
6. Ground equipment according to Division 26 - Grounding and Bonding for Electrical Systems.
7. Connect wiring according to Division 26 - Low-Voltage Electrical Power Conductors and Cables.

3.03 CLEANING

A. Refer to Section 01 70 00.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

D. Install new filters.

END OF SECTION

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SECTION 23 82 40

ELECTRIC HEATING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
1. Unit heaters (non-hazardous locations).
2. Fan forced wall heaters.
3. Baseboard heaters.
4. Cabinet unit heaters.
5. Portable electric heaters.
6. Explosion proof unit heaters.
7. Explosion proof thermostats.
8. Heat tracing (non-hazardous locations).
9. Heat tracing (hazardous locations).

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
1. All Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid.

1.03 SUBMITTALS

A. Product data sheets.

B. Dimension sheet with weights.

C. Wiring diagrams.

D. Color sample.

PART 2 PRODUCTS

2.01 UNIT HEATERS

A. [120] [208] [240] [277] [480] volts, [single] [3] phase, KW as shown on the Drawings.

B. Housing shall be heavy gauge, cold-rolled steel which is phosphatized and painted with a baked enamel finish. Adjustable louvers shall be provided to control the direction of air flow.

C. Controls shall be in an isolated compartment with a hinged cover which provides full access for installation and servicing. All heater and control wiring shall terminate in the control compartment and a complete wiring diagram shall be attached to the inside of the access cover. Controls shall include the following:
1. Heavy-duty, 3-pole contactor which provides quiet, efficient operation.

2. Bimetallic, snap action fan delay relay which energizes the fan after the heating element reaches operating temperature and de-energizes the fan after the thermostat is satisfied and the heating element has cooled.
3. Thermal cutout to de-energize the heating element if it overheats and resets when the temperature returns to normal.
4. Fused control transformer with 24-volt secondary.

D. Heating element shall be finned, steel sheath, non-glowing, and shall be warranted for 5 years.

E. Fan motor shall be totally enclosed with thermal protector and sealed bearings.

F. UL listed.

G. Nameplate shall provide data as required to comply with NFPA 70 - National Electrical Code – Section 424.28.

H. Berko, Markel, Qmark, or approved equal.

I. Remote Thermostat for Non-Corrosive Areas
1. Line voltage rated.
2. Heavy duty with SPDT switch rated 16.0 amp. at 120 VAC.
3. 46 degrees F to 84 degrees F temperature range.
4. Honeywell T6052B1013, Penn T22DA-1, or approved equal.

J. Remote Thermostat for Corrosive Areas
1. Line voltage rated.
2. Heavy duty with SPDT switch rated 16.0 amp. at 120 VAC.
3. 35 degrees F to 100 degrees F temperature range.
4. NEMA 4X enclosure with clear front cover to view set point.
5. Tin plated, externally mounted sensing element.
6. Honeywell T631F1068, or approved equal.

OR

7. Line voltage rated.
8. Heavy duty with SPDT switch rated 16.0 amp. at 120 VAC.
9. 0 degrees F to 100 degrees F temperature range.
10. Remote bulb and 20 feet of stainless steel capillary.
11. Honeywell T675A, or approved equal.

2.02 FAN FORCED WALL HEATERS

A. volts, phase, KW as shown on the Drawings.

B. Flush (semi-flush) (surface) mounted.

C. Baked enamel finish; color as specified by Engineer/Architect.

D. Completely concealed double-pole, single throw disconnect.

E. Non-glowing design heating element with 5-year warranty.

F. Impedance protected, single speed permanently lubricated fan motor with totally enclosed rotor.

G. Bimetallic, snap action type fan control switch (2-KW heaters and larger) which activates the fan after the heating element reaches operating temperature and deactivates the fan after all heated air has been discharged.

H. Bimetallic, snap action, tamperproof thermostat with enclosed contacts and positive off.

I. Bimetallic, snap action thermal cutout which will automatically shut off the heating element to prevent over heating and automatically reactivate the heater when temperatures return to normal.

J. UL listed.

K. Nameplate shall provide data as required to comply with NFPA 70 - National Electrical Code – Section 424.28.

L. Berko, Markel, Qmark, or approved equal.

2.03 BASEBOARD HEATERS

A. volts, phase, KW as shown on the Drawings.

B. Baked enamel finish; color as specified by Engineer/Architect.

C. Heavy duty, specification grade with 18-gauge metal covers.

D. Full-length linear thermal cut-out.

E. 5-year warranty on heating element.

F. Built-in 2-pole thermostat.

G. UL listed.

H. Nameplate shall provide data as required to comply with NFPA 70 - National Electrical Code – Section 424.28.

I. Berko, Markel, Qmark, or approved equal.

2.04 CABINET UNIT HEATERS

A. volts, phase, KW as shown on the Drawings.

B. Flush (semi-flush) (surface) mounted.

C. 16 gauge, heavy-duty, cold-rolled steel cabinet with baked enamel finish; sized to mount in the available space. Color as specified by Engineer/Architect.

D. Easily removable front panel for access to heating elements, motor-blower assembly, filters, and all internal components; muted black, recessed kick plate.

E. Non-glowing design heating with 5-year warranty.

F. Built-in thermal safety cutouts, which automatically shut off the heater to prevent overheating.

G. 2 speed, permanent split capacitor type motor with built-in automatic reset overload protection, with direct drive blower and with resilient mounting on a rigid frame for quiet operation.

H. Easily removed, disposable filters.

I. Bimetallic, snap action type fan control switch which activates the fan after the heating element reaches operating temperature and deactivates the fan after all heated air has been discharged.

J. Built-in, snap action thermostat with remote bulb sensor.

K. Pushbutton switches to select the 2 fan speeds and continuous or automatic fan operation.

L. Completely concealed circuit breaker disconnect.

M. UL listed.

N. Nameplate shall provide data as required to comply with NFPA 70 - National Electrical Code – Section 424.28.

O. Berko, Markel, Qmark, or approved equal.

2.05 PORTABLE ELECTRIC HEATERS

A. 120 volt, 1,500 watt.

B. Automatic tip-over switch.

C. High temperature cord and plug.

D. Heavy-duty fan.

E. 20-gauge steel cabinet with baked enamel finish.

F. 3-wire cord.

G. UL listed.

H. Nameplate shall provide data as required to comply with NFPA 70 - National Electrical Code – Section 424.28.

I. Titan T770, or approved equal.

2.06 EXPLOSION-PROOF UNIT HEATERS

A. Volts, phase, KW as shown on the Drawings.

B. UL listed for Class I, Division 1, Group D hazardous locations.

C. Corrosion resistant epoxy coated or baked enamel finish.

D. Built-in, automatic over-temperature protection provided by thermal cut-outs or thermal sensors.

E. Explosion-proof fan motor with long life ball bearings and aluminum, non-sparking fan.

F. Heating elements with heavy wall and low surface temperature.

G. NEMA 7 Control Panel Complete With
   1. Disconnect switch.
   2. Heating element contactor.
   3. Fan motor starter with overload protection.
   4. Control transformer.
   5. Protective fusing.
   6. Time delay relay.
   7. Terminals for field connections including a remote thermostat.

H. Adjustable louvered outlet grill for directing air flow.

I. Nameplate shall provide data as required to comply with NFPA 70 - National Electrical Code – Section 424.28.

J. Ruffneck FX4 Series, Berko RUX or SCG Series, Fostoria HLA Series, or approved equal.

2.07 EXPLOSION-PROOF THERMOSTAT

A. Temperature range of at least 40 degrees F to 80 degrees F.

B. Wall mounted.

C. UL listed for Class I, Division 1, Group D hazardous locations.

D. Ruffneck Defender Series, Chromalox Type WR80EP, or approved equal.

2.08 HEAT TRACING (NON-HAZARDOUS LOCATIONS)

A. Volts, self regulating electrical heating strip.

B. 16-AWG copper bus wire.

C. Self-regulating, semi-conductive core.

D. Thermoplastic rubber or modified polyolefin jacket.

E. UL or FM approved.

F. Maintain 40 degrees F pipe (or door frame) temperature when surrounding temperature is -25 degrees F.

G. System shall be complete with all necessary integral components which shall include but are not limited to power connection kits, labels, tape, splices, and ambient sensing thermostats.

H. Conform to NFPA 70, Articles 426 and 427.

I. Chromalox, Nelson, Raychem, or approved equal.

2.09 HEAT TRACING (HAZARDOUS LOCATIONS)

A. Volts, self regulating electrical heating strip.

B. 16-AWG copper bus wire.

C. Self-regulating, semi-conductive core.

D. Thermoplastic rubber or modified polyolefin jacket.

E. Tinned-copper braid.

F. Fluoropolymer overcoat.

G. UL or FM approved for Class 1, Division 2 areas.

H. Maintain 40 degrees F pipe (or door frame) temperature when surrounding temperature is -25 degrees F.

I. System shall be complete with all necessary integral components which shall include but are not limited to power connection kits, labels, tape, splices, and ambient sensing thermostats.

J. Conformity to NFPA 70, Articles 426 and 427.

K. Chromalox, Nelson, Raychem, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Heaters shall be installed where shown on Drawings.

B. Thermostat shall be mounted 4 feet above the floor where shown on the Drawings.

C. Electric heat tracing shall be furnished and installed on piping where shown on the Mechanical and Electrical Drawings.

D. Electric heat tracing shall be furnished and installed around the 2 clarifier door frames as shown on the Electrical Drawings to prevent ice from forming between the frame and door. Heat tracing shall be thermostatically controlled. Clips and an aluminum retaining bar shall be provided as shown on the Drawings to hold the heat tracing strip tight to the door frame.

TUnit heaters shall be controlled by remote thermostats which are specified in Section 16900. Mount thermostats where shown on the Drawings.

3.02 HEAT TRACE INSTALLATION

A. Aluminum tape shall be used to attach the heat trace to the PVC piping. Provide tape continuously along the entire length of heat trace.

B. All heat tracing shall be fed from a GFCI protected circuit with a 30mA trip.

C. All piping that is provided with heat trace shall have labeling identifying it as such in accordance with Article 427 of the NEC.

END OF SECTION